This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

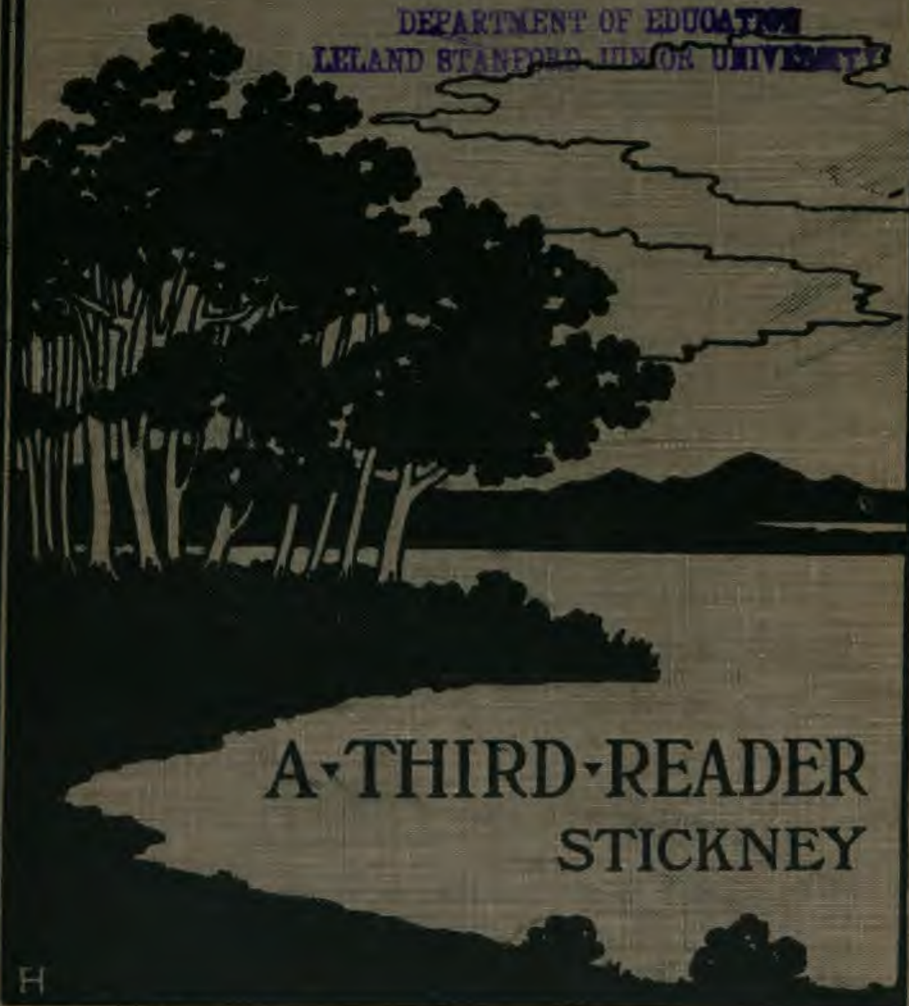
Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

Lansing, Jenny H. Stickney,
Earth and sky. number I- /
Stanford University Libraries
3 6105 04920 8700

ORY·NATURE·READERS

EARTH·AND·SKY

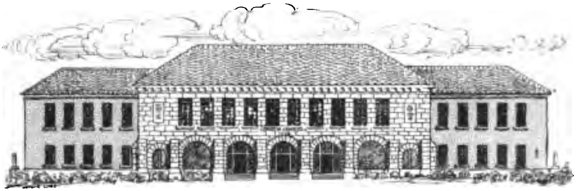
DEPARTMENT OF EDUCATION
LELAND STANFORD JUNIOR UNIVERSITY



A·THIRD·READER

STICKNEY

GINN·AND·COMPANY



SCHOOL OF EDUCATION
LIBRARY

TEXTBOOK COLLECTION
GIFT OF
THE PUBLISHERS

STANFORD UNIVERSITY
LIBRARIES

STUDY AND STORY NATURE READERS

EARTH AND SKY

NUMBER III

BY

J. H. STICKNEY

AUTHOR OF "BIRD WORLD," "PETS AND COMPANIONS"
"EARTH AND SKY, NUMBERS I AND II," ETC.

GINN & COMPANY
BOSTON · NEW YORK · CHICAGO · LONDON

ENTERED AT STATIONERS' HALL

COPYRIGHT, 1904
BY GINN & COMPANY

ALL RIGHTS RESERVED

54.7

C

LIBRARY
Leland Stanford, Jr.
UNIVERSITY

The Athenæum Press
GINN & COMPANY · CAMBRIDGE · MASSACHUSETTS

PREFACE

In the preparation of this third number of "Earth and Sky" the author has endeavored to preserve the unity of the series, and also to keep pace with the growing intelligence of its readers.

As indicated by the title, the range is wide. The object has been *to call attention* to the panorama of nature in its salient features in such way as to make natural occasion for oral teaching. Intimacy with nature, which comes to country children naturally, must be to an extent a thing of effort and convention to those of the town.

It is believed that the following simple lessons go to the heart of the things whereof they treat in such way as to awaken living interest and lead to reflection which will go on after the lessons themselves are forgotten.

Number Two specified things of earth and sky which, in the nature of the case, must be received as "gifts" by every newcomer upon earth, and used for necessity or convenience. While not exhaustive, these gifts were suggestive of a wide range.

79411

In the present number the *forces* of the material universe are called to mind, beginning with the *life* force in plants and animals. It is not intended as a book of learning; the subjects preclude any considerable reach in that line; they are such as would become matters of knowledge later on, and are for a graded school what intercourse with older people supplies in intelligent outside life, — beckoning hands to attract to something which will reward investigation.

Selections at the close of the book match the subjects treated, namely, *plant life*, *physical forces*, *animal life*, *aspects of weather*, and the *sky bodies.* Some of these should be read to the class before the pupils read them.

The author is indebted to Miss S. E. Brassil, whose notebook was drawn upon for lessons four, five, eleven, and twelve; and to Miss Mary A. Lewis, Superintendent's Assistant in the Cambridge elementary schools, for corroboration as to the interest of children in the "*invisible* things" which underlie "the things which do appear."

Selections from current juvenile literature are acknowledged as used. Thanks are due to The Macmillan Company for consent to the use of two stories from *Little Meadow People.*

CONTENTS

LESSON		PAGE
I.	INTRODUCTION	1
II.	A PANSY'S STORY	3
III.	THE GREEN THINGS GROWING	5
IV.	A ROADSIDE PLANT	6
V.	BUTTER AND EGGS	8
VI.	NETS AND TRAPS	10
VII.	WINTER WRAPPINGS	12
VIII.	PLANTS OF THE WHOLE YEAR	13
IX.	THE SONG OF THE PINE FOREST	15
X.	FRUIT TREES	20
XI.	WINTER LOVES THE CEDAR	22
XII.	TREE STORIES	24
XIII.	THE SUN	26
XIV.	LIGHT AND SHADOW	28
XV.	BENT LIGHT	31
XVI.	LIGHT DIVIDED	33
XVII.	IN LOOKING-GLASS WORLD	35
XVIII.	HEAT STORIES	38
XIX.	THE STORY OF A FIRE	41
XX.	HEAT MADE TO SERVE	44
XXI.	PUSHES AND PULLS	46
XXII.	WORKERS THAT DO NOT GET TIRED	48

LESSON PAGE

XXIII. THE MODERN GIANT KILLER . . . 51
XXIV. BEGINNINGS OF ANIMAL LIFE 56
XXV. A CREATURE WITH ONE GIFT 58
XXVI. THE EARTHWORM HALF-BROTHERS . . . 61
XXVII. THE HYDRA POLYP 67
XXVIII. THE USEFUL SPONGE 70
XXIX. THE SEA ANEMONE 72
XXX. TOOLS TO WORK WITH 75
XXXI. THE STARFISH AND THE SEA URCHIN . . 76
XXXII. THE HOUSE FLY 79
XXXIII. THREE LIFETIMES 82
XXXIV. MANTLES AND SHELLS 85
XXXV. GIVING AND TAKING 89
XXXVI. WEATHER 91
XXXVII. THE CLOUD 94
XXXVIII. STORM STUDIES 96
XXXIX. A BLIZZARD 100
XL. WIND STORIES 102
XLI. DUST TRAVELERS 103
XLII. THE FACE OF THE SKY 105
XLIII. EARTH'S NEXT NEIGHBORS 106
XLIV. THE EIGHT SISTERS 109
XLV. COUNTING THE STARS 111
XLVI. THE CONSTELLATIONS 114
XLVII. WILD WANDERERS 116
XLVIII. THE MILKY WAY 117

SELECTIONS 119–160

LANGUAGE

FOLLOWING the sentence-structure teaching of the preceding book of the series, the lessons of the present number provide for its application in *constructive work.* Pupils are at the age when something may be expected of them in response to what is given.

The call of Lesson I is for points of resemblance and difference between plants and animals. The expression of these gives opportunity for much that is better adapted to oral than to book teaching.

Accompanying Lessons II to VI a number of familiar plants may have their stories told, as, for example, the sweet pea, nasturtium, geranium, and others which may be made to grow in the schoolroom. There are stories and poems which well cover this ground, and which will add pleasure to the course. Corn, potatoes, wheat, and the garden vegetables should have their special features interpreted, and, generally, the stories of a few foreign plants whose use is common should be sought in books of information.

Leaf and flower buds with their wrappings, as introduced in Lesson VII, suggest the *collection of specimens* and *pictures* by the children, and the beginning of a herbarium and notebook.

Annuals and perennials come next, and stories of their coming and going may be called out by questions. It is taken for granted that lessons on evergreen and deciduous trees are already included in nature work, and that this book will be rather in the way of supplementary teaching.

The sun and light present more ambitious topics than belong to the grade, but the common phenomena which would match the stories of the book will be entirely practicable, and many boys will prefer this work to that upon plants. The story of a blind child, the path of the sun across the sky, the length, breadth, and height of an actual shadow, the setting up and watching of a sundial, double mirrors, etc., will reward lessons upon them.

Heat stories may be much more extended than the book affords space for, and fire is a never-exhausted field of incident. Cautions may be inculcated which will save pupils from endangering life and property.

Later pages of the book are not less suggestive than these which have been brought to notice; but by the time that a class and its teacher have gone thus far together they will need no guiding suggestions. Animal life from the standpoint of the creature itself follows the line of the new books upon animals, and story writing seems to be in the very atmosphere.

While the lessons have been prepared under the impression that much will be done with them where time and circumstance allow, it is also true that the simple reading of the lessons may be relied upon to awaken interest and wonder, inspire love of nature and pleasure in outdoor life, and influence choice of reading.

EARTH AND SKY

NUMBER THREE

I. INTRODUCTION

In Book Two of this series we tried to find out what there is in earth and sky for the need and comfort of one little resident, — *a child.* I hope you have read that book, though it is not necessary for the understanding of this one. The things no one could go without and live were air and sunshine, food and drink. There were other things that were very important, such as clothing and shelter, and there were a great many comforts to make life pleasant.

This book is to begin with Earth's lowly children of the plant world.

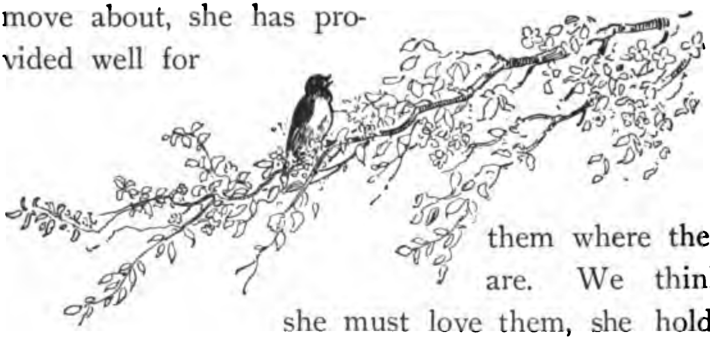
How do plants live and what do they need? They are children of the sunshine, too, and they must have air to breathe and food to eat and drink.

They breathe the air through their leaves and take food from it; they draw earth juices from the ground, and the rains and dews help them.

Just as our food helps to make our bodies, theirs goes into leaves and stems and roots. How is it that the unseen worker Life can perform such wonders?

What a dead world this would be without its living garment of green! What would springtime be without the new life that comes every year and works wonders right under our eyes!

If Mother Earth has not given the plants power to move about, she has provided well for them where they are. We think she must love them, she holds them so close. And we are glad we can always find them at home when we wish to go to see them.



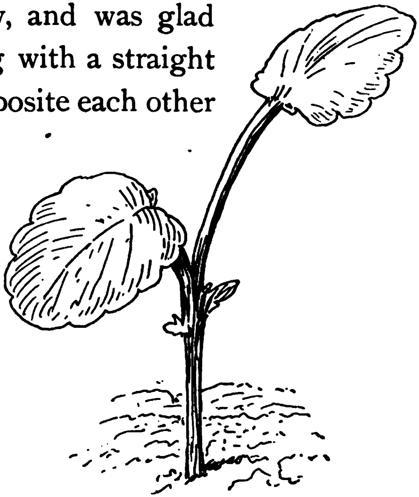
We are glad, too, that we may gather and use them without giving them pain. We like better to think about harvesting a field of grain for our food than about taking the life of chickens, lambs, and cattle.

Let us love our little "sisters" the lilies and roses, and our big "brothers" the oaks and the elms!

II. A PANSY'S STORY

Right here where I am living to-day I was born only three moons ago.

The first thing I remember is that some one came to look at me and my family, and was glad to see us. I was a little thing with a straight stem and two round leaves opposite each other on it. I know that I took care to stand straight.



The stem and leaves were my body and my dress — body and dress are all the same to plants.

I lived with all my might and I had to have more stems for the leaves that waited to grow. The plants next me on either side were taken away to give me room. They were set in other places.

For every new leaf I made I sent out more roots under the ground to feed them well. All our plant dresses were green. I do not know color through eyes as you do, but I take something from the light and air that is green when we wear it.

When I had gotten used to making leaves and was a great strong plant, something new came to me. One of my shoots did not open as the others had. I could feel it hugging something closely, as if it loved it. I loved it, too, and gave all the strength I had to it.

In a little while I understood; the outer leaves held something that was not to wear the green (with a hard name)[1] but some other colors. I never worked so in my life as I did in feeding those new buds. I felt it down to my very roots. The weather grew warmer, and one morning when I woke a beautiful blossom sat on the stem as if it had always been there. It had no green in it, but the green leaves had not let go; they held the five new ones as if they were a bouquet. Such fine texture, such a smooth satin gloss, and such rich colors I had never dreamed of.

The one who seemed to own the garden came, and I heard her say softly:

Even Solomon in all his glory was not arrayed like one of these.

---

[1] Chlorophyll.

III. THE GREEN THINGS GROWING

OH, the green things growing — the green things growing!
The fresh sweet smell of the green things growing;
  I would like to live, whether I laugh or grieve,
To watch the happy life of the green things growing!

Oh, the fluttering and the pattering of the green things growing!
Talking each to each when no man 's knowing,
  In the wonderful white of the weird moonlight,
Or the gray dreamy dawn when the cocks are crowing.

I love, I love them so, the green things growing,
And I think that they love me, without false showing,
  For by many a tender touch they comfort me so much,
With the mute, mute comfort of the green things growing.

And in the full wealth of their blossoms glowing,
Ten for one I take they 're on me bestowing.
  Ah, I should like to see, if God's will it might be,
Many and many a summer of my green things growing.

MISS MULOCK.

IV. A ROADSIDE PLANT

This brave little plant lives by the roadside all the summer through. By its side are ever so many plants with looks and ways quite unlike its own.

Boys and girls living side by side copy each other's ways. This child of the roadside never copies. I do not know that it envies the other plants their gifts; it certainly does not need to, having so many of its own. Nor does it seem to find fault with them when they press against it in the struggle to get air and light. Each takes what it can get of sunshine and rain — more, alas, than it needs of roadside dust.

Butter and eggs found early in life a little law, close at its heart, which as fast as was needful told it how to live. It was the same law that its ancestors had. The race to which it belongs has a history written in men's books, which must be a grand thing to a plant. To do a new thing is not to be thought of. It would upset everything to have a new way for butter and eggs!

Just how it had been handed down that it had but a single summer to live the plant does not know, any more than a little girl knows how it is she does things that make people say: "How like she is to her mother when she was young!"

The plant only knows better than to try to get ready for any other weather than we have between May and November.

Its life law taught it to get *something* ready in which it could keep the finest little touch of life it had ever known.

To make sure it should not fail there must be a great many of these, and the boxes that hold them must drop into the friendly earth when they are ready to leave the mother plant.

All of you know how at the right time Spring comes with the only right keys and lets the life begin again. The body part could not stand the cold of winter, so it has to be given up in autumn and made anew every year in spring.

What other plants could tell the same story up to this point?

V. BUTTER AND EGGS

THE way of this plant is to grow tall and to stand upright; therefore its stem must be strong, for the blossoms are heavy. According to its strength it will be from six to eighteen inches in height. The wind will blow upon it, and it must bend in order not to break.

See how narrow its leaves are! This is the way to have a great many, for leaves do not like to crowd each other. The leaves are gray green, except in swampy places, where they may be quite fresh and bright. They are joined, as the picture shows you, directly to the stem.

The flower wants to attract attention. It is good for it to be bright, and the two colors, yellow and orange, are better than one. The leaves protect it from crawling insects which it does not want, and the bright colors draw to it some of the flying ones that it wishes help from.

On a single stalk there will be many blossoms, but not all at once. The lower ones open first. When the bees have found its nectar and pollen a blossom fades and drops, and others higher up will take their turn.

We may find on the same stalk seed pods nearly ripe, fading blossoms, others just opening, and tight-shut buds. It may even happen that when frost comes early there will still be tiny buds at the top.

The form of the blossoms is the best part of the story. There is a spur for the nectar with a plenty of pollen, but both are shut away from sight. Ants and small flies are not able to get it; they find no opening. Bees, being heavier, open the lid when they light upon it. Their weight opens it. They push the head in and their long tongues reach the sweet drop.

While they are feeding so daintily their heads will be near to the stamens where the pollen is. And pollen will be carried to other butter and eggs blossoms, for when bees go out for this flower's nectar they will seldom visit other kinds of flowers.

This pollen carrying is what the plants need. The bees are their messengers. When the pollen and nectar are gone the flowers take down their sign to the bees. The blossoms fade and drop.

VI. NETS AND TRAPS

THIS title makes you think of animals; but the creatures caught are not such as thoughtless people set traps for.

It is a little plant that sets traps *of its own making* to catch insects, not for sport, but to keep itself alive.

Most plants depend upon the ground, and use their roots for getting food. The sundews have very weak roots, and they find this other way so profitable that they do not need to try to strengthen their roots.

The flower stem rises about an inch and a half in height and bears a delicate white blossom.

The deadly weapons of destruction are in the rosettes of green and scarlet leaves that lie close to the ground.

The microscope shows that every leaf is thickly covered with hairs, — a full-sized leaf might have two hundred of them, — and each of these ends in an oval-shaped knob which is a little gland.

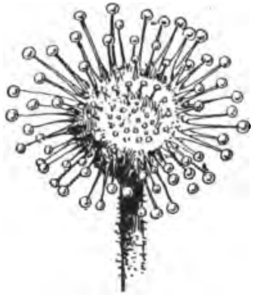
These hairs or tentacles are always bathed in a sticky fluid which sparkles in the sunshine like dew. This gives the plants their pretty name, — sundew.

Every unwary insect that lights on the tentacles on the center of the leaf finds itself held, and the longer tentacles on the edge of the leaf begin to bend over it till it is shut in. In a moment it is smothered, and the fluid in the glands makes the leaf a stomach for digesting this food for the plant. You can see the sticky fluid without a microscope.

This seems a strange story for a pretty, innocent-looking plant. It belongs to a family of plants called *insect eaters*, a strange odd family for plant world.

This shows that the getting of food is the first law in the world of lower forms of life, and when one part is weak some other will find new powers.

The sundew way is to set traps.



VII. WINTER WRAPPINGS

All of us love winter if we are well and strong and if our clothing keeps the cold air from chilling us.

Seeds that drop into the earth are safe, for they are in tight cases or boxes, and snow makes a warm wrapping for the ground.

Having no tender flesh, the life in a seed may sleep till the right time comes to wake and grow.

There is another way for life to wait till winter has gone. Some plants keep the growth their stiff stems have made to support the new life of a new summer. All the shrubs and trees grow in this way.

Before the autumn frosts come they get new buds ready for the coming year and wrap around them a kind of cover sealed tight from damp and frost. Each has its own material for these wraps; some are like skin and some like wool. Some are painted over with sticky fluid that grows as hard as glue.

In these winter cradles, carefully tucked in, hosts of sleeping buds are rocked by the winds and made safe from frost and rains and snows.

VIII. PLANTS OF THE WHOLE YEAR

Our little soft-stemmed plants come as spring guests for a summer visit. We make much of them, for we know that autumn frost will blight them so that winter will show no trace of them. In the morning of the year they grow and flourish, but in the evening they are cut down and wither. This is the glory of the daisies and buttercups, of wheat, barley, corn, clover, etc.

The strong plants that learned the secret of keeping the stock of nourishment taken day by day and storing it in stiff, strong stems keep themselves in our remembrance all the year, even though their tender tissues are destroyed. Like ships with all sails reefed these shrubs and trees wait for a favorable time for action again.

Adding strength year by year some of them come to be tall trees which, when their leaves are gone, make pretty pictures against the sky.

We may think of them as giving up their fresh foliage in gentle faith that summer will bring it back.

The rose and the oak tree stand all the winter with bare branches but a warm heart, and make no sign that they have buds of promise hidden close.

But this is not all that Nature can do with the gifts of life she holds. Winter would be bare and lonely with no trace of green. So in a few of her tree families she teaches another way. Their leaves stay closely curled or rolled so that they can hold all that summer brings and keep the trees green and fully clad for Christmas and the winter snow.

This is the glory of the evergreens.

The pine and cedar, the fir and hemlock are our winter heroes. After winter is over and all the world is robed in green, new leaves come to the evergreens and the old ones fall quietly and make a carpet of brown around the tree trunks.

IX. THE SONG OF THE PINE FOREST

THE pine forest is a wonderful place. The pine trees stand in ranks like the soldiers of some vast army, side by side, mile after mile, in companies and regiments and battalions, all clothed in a sober uniform of green and gray. But they are unlike soldiers in this, that they are of all ages and sizes; some so small that the rabbits easily jump over them in their play,

and some so tall and stately that the fall of them is like the falling of a high tower.

The pine trees are put to many different uses. They are made into masts for the gallant ships that sail out and away to distant ports across the great ocean. Others are sawn into planks and used for the building of sheds; for the rafters and flooring and clapboards and other woodwork of our houses; for railway sleepers, scaffoldings, and hoardings. Others are polished and fashioned into articles of furniture.

Turpentine comes from them, which the artist uses with his colors and the doctor in his medicines, which is used too in the cleaning of stuffs and in a hundred different ways; while the pine cones and broken branches and waste wood make bright crackling fires by which to warm ourselves on a winter's day.

But there is something more than just this I should like you to think about in connection with the pine forest; for it, like everything else that is fair and noble in nature, has a strange and precious secret of its own.

You may learn the many uses of the trees in books, when men have cut them down or grubbed them up, or poked holes in their poor sides to let the turpentine run out; but you can learn the secret of the forest itself only by listening humbly and reverently for it to speak to you.

Nature is grander and more magnificent than all the queens who have lived in sumptuous palaces and reigned over famous kingdoms since the world began; and though she will be very kind and gracious to children who come and ask her questions modestly, and will show them the most lovely sights and tell them the most delicious fairy tales that ever were seen or heard, she makes very short work with conceited persons.

She covers their eyes and stops their ears, so that they can never see her wonderful treasures or hear her charming stories, but live, all their lives long, shut up in their own ignorance, thinking they know all about everything as well as if they had made it themselves, when they do not really know anything at all. And because you and I want to know anything and everything that Nature is condescending enough to teach us, we will listen, to begin with, to what the pine forest has to tell.

When the rough winds are up and at play, and the pine trees shout and sing together in a mighty chorus, while the hoarse voice of them is like the roar of the sea upon a rocky coast, then you may learn the secret of the forest. It sings first of the winged seed, then of the birth of the tiny tree; of sunrise and sunset, and the tranquil warmth of noonday; of the soft, refreshing rain, and the kindly, nourishing earth; of the white moonlight, and pale, moist garments of the mist, all helping the tree to grow up tall and straight, to strike root deep and spread wide its green branches.

The voice sings, too, of the biting frost, and the still, dumb snow, and the hurrying storm, all trying and testing the tree, to prove if it can stand firm and show a brave face in time of danger and trouble. Then it sings of the happy springtime, when the forest is girdled about with a band of flowers; while the birds build and call to each other among the high branches; and the squirrel helps his wife to make her snug nest for the little brown squirrel babies that are to be; and the dormice wake from their long winter sleep, and sit in the sunshine and comb their whiskers with their dainty little paws.

And then the forest sings of man — how he comes with ax and saw, and hammer and iron wedges, and lays low the tallest of its children, and binds them with ropes and chains, and hauls them away to be his bond servants and slaves.

And, last of all, it sings slowly and very gently of old age and decay and death; of the seed that falls on hard, dry places and never springs up; of the tree that is broken by the tempest or scathed by the lightning flash, and stands bare and barren and unsightly; sings how, in the end, all things shrink and crumble, and how the dust of them returns and is mingled with the fruitful soil from which at first they came.

This is the song of the pine forest, and from it you may learn this lesson: that the life of the tree and of beast and bird are subject to the same three great laws as the life of man,—the law of growth, of obedience, and of self-sacrifice. And perhaps, when you are older, you may come to see that these three laws are after all but one, bound forever together by the golden cord of love.

SELECTED.

X. FRUIT TREES

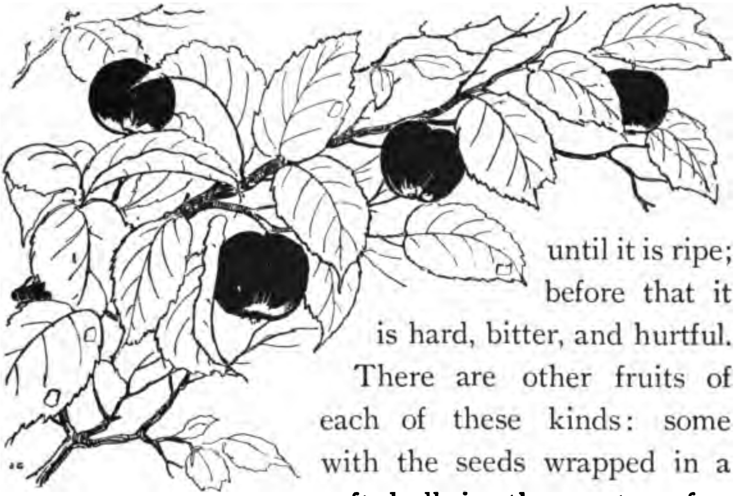
THE apple and cherry shall be our examples of fruit trees. Their strong trunks add a little stoutness each year till they are larger than our bodies; and their great green crowns reach high above our heads.

Birds build nests in their branches, sure that the thick leaves will conceal and shelter them.

The branches of the apple tree are nearly horizontal, but the cherry branches reach upward. The blossoms are as beautiful as garden flowers. In its time of blossoming each is like a huge bouquet held high for every one to see.

In warmer climates there is a nut tree which is the rival of these. It is the almond. It has pink with the white of its flowers, as the apple tree has.

The fruit of trees is out of easy reach, but there is another protection, — it is not ready to be eaten until it is ripe; before that it is hard, bitter, and hurtful. There are other fruits of each of these kinds: some with the seeds wrapped in a soft hull in the center of a thick layer of flesh; some with a kernel inside a hard stone; and some, like the almond, whose kernel is the part that is good to eat.



Put all the fruits you know into classes, and try to get acquainted with the unseen spirit of life in each which takes from earth and air what it needs, and builds a form and lives a life of its own.

Do we not all agree that fruits are the best gifts of earth for her higher children to eat?

XI. WINTER LOVES THE CEDAR

SHUT your eyes and think of the cedar tree. It is a contrast to the pine. The cedar root strikes down deep into the ground; that of the pine spreads out broadly. In an open field the pine might be uprooted. That is why the home is apt to be a forest. Cedars will grow on a hill slope or in open pastures because their roots are anchors.

The cedar trunk runs straight to the top like that of the pine, and both will sway at the top when the wind blows and the sound is like that of the sea; but the cedar is slender and tall where the pine is broad-spreading. The branches curve upward toward the trunk in a clinging way and are so close together that the wind goes around the crown of the tree as it does around a wall. The birds know this, and if you wish to look for them on a stormy day it may help you to remember it. Even snowflakes are kept mostly on the outside of the branches.

Leaves come next in the picture we are drawing. You have been taught in Book One how the pine-needle-shaped leaves of the pine resist the wind and storm; the cedar leaves do it in holding together as if they were braided. What seems to be a leaf is a twig with many leaves, and when the time comes for new ones to grow, those of a year old give place to them as older children should to younger.

You know cedar cones; I wonder if you also know the blossoms. Hear what Lowell wrote of them:

> Red cedars blossom too, though few folks know it,
> And look all dipped in sunshine like a poet.

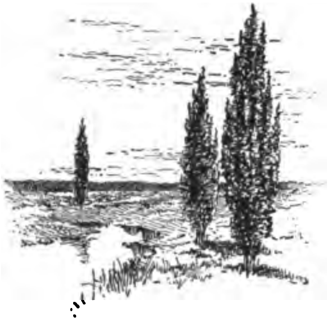
Look for the blossoms in May. Sometimes the wind will carry away the pollen like a cloud. Not all the trees have the stamens; they have instead green blossoms that bear berries if pollen falls upon them. Robins eat the berries, and the cedar bird is so named because at one part of its life cedar berries are the chief part of its food.

If you examine one of these berries, you will find scales overlapping in the shape of a cone. This proves that the cedar and pine are cousins even if the cone scales do not grow hard and dry. Another curious thing about cedar seeds is the long time they wait in the ground before they begin to grow — sometimes till the old tree is cut down.

XII. TREE STORIES

THE poplar's legend is very old. It explains the tree's way of holding its branches.

Some one had stolen gold of his master and had hidden it among the branches at night when the poplar was asleep.



In the morning the owner came seeking his treasure among the trees.

Sure of their innocence all the trees denied it, the poplar included.

To make their innocence quite plain they were asked to hold up their branches. When the poplar lifted its arms the treasure fell from them, and such was its astonishment that it holds them so to this day.

Reptiles dislike the ash tree. They even avoid its shade. It has been said that they would as soon go through a fire as a barricade of ash branches.

Another superstition says that witch hazel bends to the water, and to gold. A branch of the tree is used to show where to find water easily and dig a well, or where to search for gold.

The linden, or basswood, is grown for its beauty on lawns. It is a good roadside tree because wounds on it heal easily.

Its story is in connection with its fruit. It likes to grow along the banks of rivers and lakes; then when the winged fruit drops off, the seed is heavy enough to sink, but it has a wing which makes a raft and floats it along until it finds some bold headland or island on which to plant itself.

It will take it fifteen or twenty years to come to its growth, but this is not a long time for a tree.

The maple has winged seeds too. It is valued for its close shade, its shapely crown, and its bright autumn colors.

The height of trees is interesting. Remember that an apple tree stops at twenty-five feet to keep its apples from getting too badly bruised when they fall. Use this twenty-five feet as a measure for other trees. The elm rises to sixty feet.

XIII. THE SUN

We have been looking all this time at the way life works in the world of plants. It is time we let something else have its turn.

Have you read or heard the stories of The Seven Little Sisters who live on the Great Round Ball that Floats in the Air?

Their homes were far apart, but all of them looked up into the same bright sky. The same sun gave them all light.

There are two reasons why we cannot study the sun very well. First, it is too far away; and second, its light is too bright.

Did you ever see a balloon before it was cut loose and allowed to rise into the sky and sail away? And did you notice how quickly it grew smaller, till the people in it could not be seen at all; and then how easy it was to lose it in the sky because its colors grew so dim?

A fire balloon or a skyrocket, being bright, will show better, but they seem very small when they are high overhead.

Suppose a balloon were to go up a mile, or that a great fire balloon went ninety times as high, could you follow it with your eyes? Possibly.

Think now that the great king of lights, the sun, is a million times farther away still, and yet we see it every morning and can trace its way across the sky every clear day!

What a wonderful thing is light that it can fill all our sky! And what heat the sun must have that it reaches all the way to us!

Light and heat have very constant ways that we call *laws*, because we may trust them and work with them. Sunbeams are the sun's fingers reaching down to work for us, and we may know something about them. All of us do know something already, even if we have not yet learned to tell it in words. In the next lessons we will talk of things that belong to light.

XIV. LIGHT AND SHADOW

Baby Ned was on the house porch. It was nine o'clock in the morning and the sun shone clear and bright.

Looking over his shoulder to see if Jane were still near by, he saw something new to him. Again and again he turned his head with a puzzled look in his eyes to look at it.

"What is it, Ned?" asked Jane.

That was what Ned's mind was asking. He did not know. He moved and it moved. It looked a bit like himself. He had a little spade in his hand and he waved it. The queer sight waved one too.

"Why, Ned, it's your shadow! See me make shadows!" So Jane stood in the sunshine and made motions that would show on the house wall.

Little as Ned was he looked a bit ashamed that Jane had read what was going on in his mind, so he did not care to see shadows any more. But he had begun to learn some very wonderful things.

While Ned was having his nap, Jane told his mother what Ned had seen for the first time.

" I know," she said, " that it is the sun that makes the shadows, but how does it shape them so? "

" If the sun did not shine brightly there would be no shadows," said the mother, " but it was Ned's body that made and shaped them. If the light could have gone through Ned it would have been light on the house wall instead of dark."

" But why should the shadow wait till it got to the wall? " asked Jane.

" It did n't. The shadow reached all the way from Ned's back to the wall. If there had been no wall, you could have seen its shape only on the floor, and the shape would have been different. Ned would have looked taller.

" The best shadows are made when the sun is low in the sky. We will all go out at five o'clock and see ourselves, and the house, and the trees making tall shapes on the ground.

" If Ned has a little fear we will help him to get over it. I knew a little girl who could not get over her fear of shadows. She was not afraid in the dark; but when evening came, and lamps were lighted, she could not help looking for 'the shapes.' When she went up the stairs to go to bed, she begged to hold the lamp herself, so that the shadow shapes would fall behind her."

These shadow images are often very odd; they can never be as true as the light images given us by a mirror, or by the still water of a pond.

Here is a poet's story of a true image:

> I laid me down
> On the green bank, to look into the clear
> Smooth lake that to me seemed another sky.
> As I bent down to look, just opposite
> A shape within the water gleam appeared,
> Bending to look on me.
> I started back;
> It started back; but pleased I soon returned;
> Pleased it returned as soon with answering looks
> Of sympathy and love. — MILTON.

Do you know the story of Narcissus, who fell in love with his own image thinking it a beautiful nymph of the fountain?

XV. BENT LIGHT

People tell us that light comes "straight from the sun." Did you ever hear of its getting bent and broken after it gets to us?

A little girl named Helen had a doll's looking-glass given her. "Helen" means light; she did not know it then, but she was greatly pleased with her mirror, for she was fond of light and its ways.

For a few days she carried the mirror about with her and played tricks with it.

One of the plays was "throwing light." If she held the mirror in the bright sunlight, she could throw a bright spot wherever she pleased in the room. If she kept the mirror moving, the bright spot would move too. She made it play around people's faces and in their eyes till they begged her not to, it was so bright.

In the evening she asked her papa how it came to be so dazzling. He told her that the mirror drew a great many rays to itself, but that the coating of quicksilver on the back would not let them go through. They were turned and sent on a new errand. The smoothness of the glass and the quicksilver made the spots bright.

"Anything," he said, "on which the rays fall must either take them or send them somewhere else, just as we should have to do with people who might come to us.

"The light that comes to our eyes, except when we are looking straight at the sun, is on its second errand or course. We call it reflected light."

He told her another thing that she had never thought of. It was that when she looked at him it was light moving *from him to her* that she saw him by, though it was light from the sun.

"Could it have a third errand then?" she said.

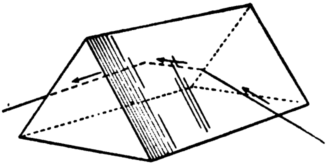
"No, when a ray has come to our eyes it has done its work."

Afterward, when this little girl was told that she could be a light in the world, she understood that she was to reflect the light of love and truth, just as bright objects reflect sunlight.

XVI. LIGHT DIVIDED

Another way that light gets broken and taken apart always seems wonderful to us even when we understand all about it.

Not every bright thing will do this. The things that break light apart must first open their doors to it and let it in a little way. Then they seem to change their minds and send it out by another door. The dotted lines through the prism show it.



When it comes out it has been divided into seven strands, or bands, and no two of them are in the least alike. If they fall upon anything on this errand they give it the colors of the bands,—red, yellow, blue, orange, green, violet, and indigo.

Seen out of doors against the great dome of the sky they take its shape, and because the raindrops helped to make them, we call the beautiful half circle a ***rainbow.***

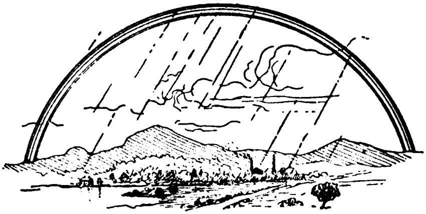
All this you knew before. What I wish to tell you beside is: that when men had seen rainbows many, many times, and had divided light with prisms of glass, making all the colors, they invented a new instrument called the *spectroscope.* With the spectroscope they can divide the light of anything that is shining or burning, even that of the very distant stars. In this way new sky stories have been written.

A great many new nature stories have been added since broken or refracted light could bring news from the far away stars.

Leaves and flowers had the secret first. No one of them took the light just as it came to them. Some would absorb or take in a part and reflect or send out the rest. Pure red flowers took in six of the colors, or the light that made them, and sent out the one they chose for their own. Yellow flowers made another choice. Leaves seemed to agree to have one color, which was a good way for us.

When we see the orderly behavior of light and flowers, working together to make earth beautiful, we must better do our part in using heaven's good gifts.

Green calm below, blue quietness above.



XVII. IN LOOKING-GLASS WORLD

To punish the kitty for not folding its arms properly, Alice held it up to the looking-glass, that it might see how sulky it was — "and if you 're not good directly," she added, " I 'll put you through into Looking-Glass House. How would you like that?

" Now, if you 'll only attend, Kitty, I 'll tell you all my ideas about Looking-Glass House.

" First, there 's the room you can see through the glass — that 's just the same as our drawing-room ***only the things go the other way.***

" I can see all of it but the bit just behind the fireplace. Oh, I do wish I could see that! I want so much to know whether they 've a fire. You never can tell, you know, unless the fire smokes, and then smoke comes up in that room too — but that may be only a pretense just to make it look as if they had a fire.

"The books are something like our books only the words go the wrong way; I know that because I've held up one of our books to the glass, and then they hold up one in the other room.

"Oh Kitty, how nice it would be if we could get through into Looking-Glass House! I'm sure it's got — oh such beautiful things in it! Let's pretend the glass has got all soft like gauze. Why, it's turning into a sort of mist now, I declare — "

She was up on the mantel when she said this, though she hardly knew how she got there.

In another moment Alice was through the glass and had jumped lightly down into the looking-glass room.

LEWIS CARROLL.

It takes a whole book to tell Alice's adventures in Looking-Glass World, for she went further than the house she had been so anxious to see. When the quest ended the story says she waked.

"You waked me out of oh such a nice dream!" she said, "and you've been along with me, Kitty, all through Looking-Glass World."

Image making is different from "bending" or "dividing," but it includes both of them. It makes a colored photograph without using a camera, and if the subject is alive the image seems to be alive.

How strange it seems that one's image should face the other way! Yet when we know about reflected light it would be stranger if it did not. What if it were also upside down?

What a pity that the mirror cannot *keep* some of its image-pictures. But, on the other hand, mirrors are too costly for a single using. Is it not wonderful that so many images can come and go leaving no telltale trace?

Try some experiments for yourselves. Walk toward the image and see it walk to you. Baby Ned had to learn that it was himself and not another boy. You know it so well that you have forgotten when and how you found it out.

Have you ever thought that you never saw your real faces, but only the image faces that reflected light gives you?

XVIII. HEAT STORIES

The behavior of Heat when it comes to the earth is nearly as interesting as that of its sister Light.

Both are daughters of the Sun. It is said that Earth dimly remembers a time when she herself was a great ball of fire and light. That was before there was any such earth as we know about. Deep down in her heart she is still terribly hot.

Vesuvius and Etna, volcanoes in Italy, and Mont Pelee, which has worked such dire disaster in our own time, keep the story from being forgotten, and boiling springs tell the same about the center of the earth.

Light comes to us through the wonderful gateway of sight. Its entrance windows are our eyes. Heat coming by the same rays makes itself known through touch and feeling.

Heat is a true fairy,—gentle, obedient, kindly, helpful, comforting; but, like many fairies or things without human souls, just as likely to be fierce, cruel, destructive, deadly.

It needs to be understood and to have a master. Taken so, it is obedient and useful.

How much do we know about its ways?

Entering a room, noiselessly and invisibly, it fills every part, doing what it can. It moves in little waves in the air. This is called *radiation.*

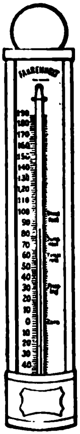
Some things receive it readily and hold it well, and some are very slow to take it. You can find out what these things are. In Book Two we had the story how heat gets stored in plants and shrubs, and waits till it is needed for man's use.

Wood and coal, oil and gas, alcohol, and a great many other things have heat imprisoned. These substances are food for fire, which delights to set the heat fairies free. Setting heat free is called *burning* or *combustion*, whether you see a flame or not.

Paper and light cloth have but a little heat, and they let it go in bright flame the moment fire touches them; a bed of coal has its heat locked up so tightly that it takes a strong fire to get hold of it, but it has greater strength when it does get hold, and will work through piece after piece till every part has breathed out its strong breath and left nothing but a bed of cinders.

Fire catches hold of gas and alcohol more readily even than of cloth or paper, and the breath they give out is fiercer than that of coal. You know through what tiny tubes they are allowed to come into touch with anything that will set them free, or, as people say, *ignite* them.

It is safe for you to make some experiments with heat that is not ignited. You can hold an iron poker and a wooden stick with one end on the top of a hot stove and see in which heat comes first to your hands. Put things made of iron, tin, aluminum, nickel, earthenware, soapstone, etc., on the stove or in the sun, and see which gets hot soonest; then take them away and watch the cooling again.



Water and mercury are convenient heat measurers. At so many degrees (32) water freezes, and at so many (212) it changes to vapor.

Mercury is a liquid at ordinary temperature. It takes a cold of 40° below zero to freeze it. By means of a thermometer (*thermo*, heat; *meter*, measure) its least change can be measured. The mercury *expands* when the heat is increased and needs more room. Because it fills the bulb and has nowhere else to go it rises in the tube. Then a scale on the frame of the thermometer registers the changes of heat.

It is not so safe to play with *fire*. The next lesson tells some of the dangers.

XIX. THE STORY OF A FIRE

I WAS awakened by noises which seemed to have been going on in my head, and found that people were shouting outside, and that there was a dreadful smell of burning.

Rupert called and said: "Henny, dear, the house is on fire! Put something on and come quickly."

The people who were saving the things saved them all alike. They threw them out of the windows, and, as I had seen the big blue china jar smashed to shivers, I felt a longing to go and show them what to do; but Rupert seized me by the hand and dragged me off.

Jane was in the hall and said to us: "Where 's Master Cecil?" I did n't stop to ask how it was she did n't know. I suppose we both looked up at the nursery window, and there was baby Cecil screaming for help. Other people had seen him, and two or three pushed into the house. They came out gasping and puffing, and I heard one man say: "It 's too far gone. If you got up there you 'd never get down again."

I thought of the back stairs. There was a handkerchief in my pocket, and I soaked it in the water on the ground. I think my idea must have been written on my face, for Rupert said: "Let me go, Henrietta!" I pretended not to hear, but he came after.

The smoke came rolling down the passageway from the front of the house, and by the time we got to the front stairs we could not see or breathe, in spite of the wet cloths over our faces, and our eyes smarted with the smoke. "Go down on all fours," cried Rupert, and I did. It was wonderful.

When my face was close to the floor there was a little bit of fresh air, and above this the smoke rolled like a cloud. I could see the casters of the table legs, but no higher up.

But in spite of the fresh air it grew hotter and hotter, and the smoke grew thicker. We could hear the roaring of the flames, and I never knew what it was to feel thirst till then.

I heard Rupert say: "O Henny, you good girl, shall we ever get down again!" I could n't speak, my throat was so sore, but I remember thinking, "It 's like going up through the clouds into heaven, and we shall find Cecil there."

After that it got clearer, and when we were at the top we stood up and found our way to the nursery by hearing Cecil scream. The great difficulty was to get him down, for we could n't carry him and keep close to the floor.

So I said: "You go first on hands and knees backward, and I 'll tell him to do as you do, and I 'll come last, so that he may see me doing the same thing and imitate me."

Baby was very good about it, and when the heat worried him, and he stopped, Rupert said: "Come on, Baby, or Henny will run over you."

When we got to the door the people began to shout and cheer. It made me very giddy, and so did the ringing of those dreadful bells. I think I shall always feel sick when I hear hurrahing now.

From *A Great Emergency* by MRS. EWING.

These children had read a book which told what to do in emergencies, and when this emergency came they showed what is called *presence of mind* in remembering what they had learned.

XX. HEAT MADE TO SERVE

We have read that light could be broken, bent, divided, and scattered.

Heat likes better to be led or *conducted;* but it will allow itself to be sent on errands just as the bright bit of mirror sent light, only you must remember that we cannot see it go. *Feeling* must act as its interpreter.

The warm blood in our bodies comes from burning or combustion, and the fuel is our food. If one of you has warm hands and another is cold, you can join hands and exchange a little of the warmth. A bit of tin lying in the sunshine will get too hot to be touched.

Let us try to tell the story of the kitchen stove.

With plenty of fuel, soft for quick catching and hard for strong holding, a fire is built every morning in this iron box with many chambers.

The first result is that the stove begins to feel warm, which means that it has more heat than it can hold, and will give some away.

The water that was put into the teakettle set over the fire-box changes from cold to warm, from warm to hot, and, if it is not taken from the fire, will lift itself into the air in steam and leave the kettle dry. If it is cold out of doors, we may see tiny beads of water on the window panes, or feel it in dampness on the walls of the room.

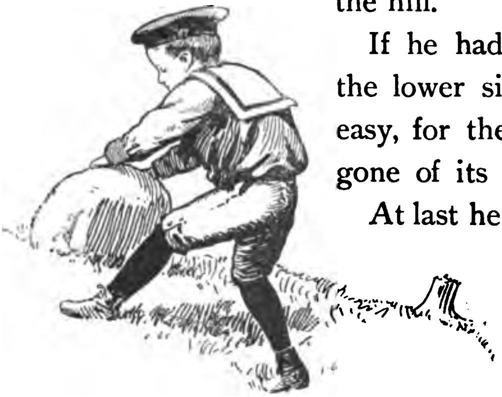
Broken grains of wheat or oats in the hot water of the double boiler will soften and swell, so that the water will seem to be lost. Flesh of any kind will frizzle in burning, and, if allowed to come into touch with flame, will burn with great sputtering.

One of the compartments of the stove is kept tightly shut except on the side toward the fire. The walls of this become almost as hot as the flame itself, and the air is too hot to bear on the hand. To make this useful, a pan of biscuit or some potatoes are put in, and one who is cooking knows how long it will be before the heat has done its work upon them. If they are forgotten for an hour or two, nothing will be left but cinders.

After breakfast, if it were on a Tuesday, perhaps we might have a different heat story. Try to tell it.

XXI. PUSHES AND PULLS

Look! Here is somebody tugging with all his might! He thinks he can start that rock. He knows that if he can it will go of itself the rest of the way down the hill.



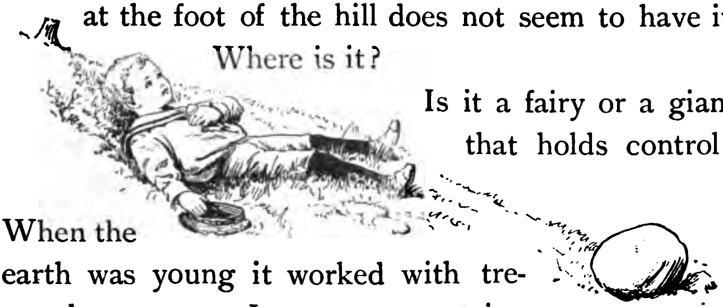
If he had loosened the earth on the lower side, it would have been easy, for the rock would then have gone of its own accord.

At last he put all his strength into a quick pull on the other side. He felt the stone move; then he sprang aside to keep himself from going with it. The big stone rolled and tumbled. What made it? It was in danger of going past the place where Johnnie wished to have it stop.

"You were hard to get waked up," he said, "but now you are too strong for me." The boy had used all his little stock of strength, and he lay down to rest and get it back again before he did the next thing he had in mind. What about the rock, — did it get tired?

Push! Pull! Shove! Tug! Hold! Lift! These are words of command, they tell that strength or force with a will is called for.

What an odd thing strength is! Johnnie lying there on his back does not show an ounce of it. The stone at the foot of the hill does not seem to have it. Where is it? Is it a fairy or a giant that holds control?



When the earth was young it worked with tremendous power. It tore up mountains, it lifted valleys, it crushed forests. It does such things even now in our time.

When the earth was young, people called these powers gods. Nowadays we know they are the working of the one God, who made all things, and whose power controls all things.

Strength or force shows itself only while it is working. Yet there was a force that was in the rock before Johnnie tried to change its place, and that stayed with it all the time it was moving and when it stopped. What force was that? The force that held it to the earth. Its name is gravitation.

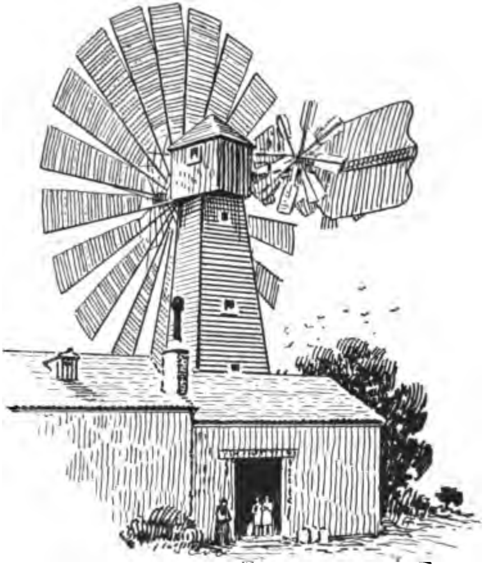
XXII. WORKERS THAT DO NOT GET TIRED

THE force that began the work on the hillside was the boy's will. That set the muscles in the arms at work, and nearly all the muscles in Johnnie's body helped. No wonder he got tired. When he lay down, some other hidden workers took Johnnie in hand, and in a few minutes he was ready for more work.

This is the way men work everywhere with the mind and the will, using their servants, the muscles, and telling them where to use strength, and how much is needed. This is the way the horse, the mule, the ox, the camel, and the reindeer work for us, getting tired and resting.

A little plant growing in a crevice in a great rock has been known to break it open to make room to grow.

Let us think now of other kinds of force, such as do not get tired and have to stop and rest to get new strength.



Out yonder water is falling over the rocks. Is there any force there? The boy is going to throw in a dead branch broken from a tree. What is the water going to do about it?

A hundred times as much force as the little boy used to move the rock is being used every minute. The boy could work a few minutes; the men or the horse could work a few hours at a time; that little brook works all the year around.

After men had seen that strength run to waste year after year it came into their minds to harness it to a great mill wheel, as a horse is harnessed to a plow. So, a little way down before the stream was to spread out to make a pond and cover a little valley, they built a mill and used the strength the water had laid up in its course to saw trunks of trees into planks and boards.

Elsewhere a great pond held water which was using its strength only in standing still. Men found out a way to raise some of it to the top of a high hill close by.

They called upon the wind to help them do this, and the way they spoke to the wind was by building another kind of mill with great fans.

Men who had been toiling with oars to overcome the strength of wind and water in crossing lakes and streams, or in going out upon the sea, found still another way to save their own strength and use something that would not get tired. They made a sail of cloth, and the boatman by ropes or cords in his hand turned it to catch the breeze. The picture shows a ship fully rigged with sails and ropes and spars.

XXIII. THE MODERN GIANT KILLER

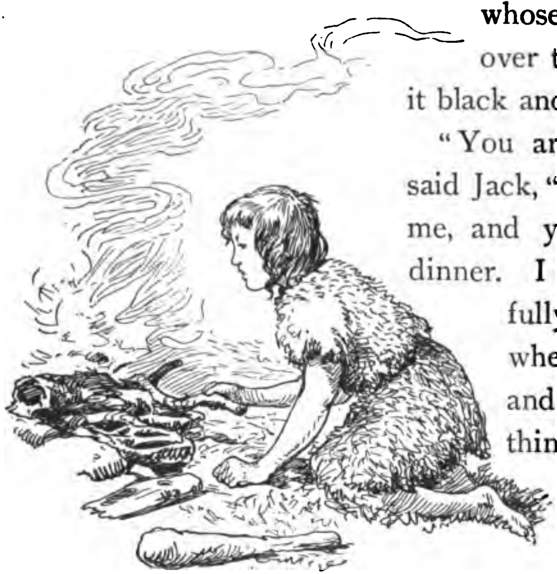
ONCE upon a time we all believed that there used to be giants in this beautiful, wonderful world of ours. They grew to be so objectionable that a hero whom we know as Jack felt himself called upon to suppress them.

It is highly possible that Blunderbore and his brother giants of the Fe-Fi-Fo-Fum school never existed; and it is by no means certain that Jack of the storybooks was ever born.

But for all that, there have always been real giants in the world; and there have been Jacks to keep them in order when they were unruly.

These strong ones are the children of Dame Nature, and the way to manage them is found out by climbing the bean stalk of knowledge, which sprouts, nowadays, in the back garden of every cottage home.

Long, long ago, when the ancestor of our modern Jack was so young that he had not invented the letters that spell his own name, he saw the great red giant, whose name is Fire, pass over the forest and leave it black and desolate.



"You are a savage giant," said Jack, "but you shall warm me, and you shall cook my dinner. I will feed you carefully; I will fan you when you are faint; and you shall do many things for me in days to come."

And for all he was a giant he would come at Jack's bidding by the rubbing of two sticks, as meekly as an obedient child; but he had to be watched or he would burn Jack's fingers, and when very hungry would swallow up Jack's house and all his possessions, as if to say: "You must look out sharply if you mean to be master."

And there was another mighty but invisible giant, whose name is Wind, and he was the playfellow of the giant Fire and encouraged him in his violence.

Sometimes Wind was good tempered, and would breathe softly on Jack's face when he was hot with his work in the field, and would sing a weird song through the pine trees, which the boy liked to listen to; but at other times a savage mood would come upon him and he would break off great branches of the trees, and tear down Jack's house, and trample on his growing corn.

"Aha!" Jack would laugh, "you are strong, my friend,—stronger than I,—but you shall help me!"

But the giant laughed and whistled as he went to a third great giant, whose name is Water. Jack, standing on the hilltop, saw this third giant stretched away as an ocean till he met the far away sky.

And the invisible giant Wind seemed to stoop down to his brother, Water, who splashed him in play. "Aha!" said Jack, "you shall *both* help me!"

And the boy made a boat, and the giant Water tossed it hither and thither. Then he rigged a sail, and the invisible giant leaned against it; and Jack became the master of these two giants, who did his bidding and carried him whithersoever he pleased, about the coasts of his island home.

For Jack had learned that even giants will willingly obey if you know how to ask them. It took him years to learn their nature; but the more he learned, the more honestly they served him.

The Wind was often obstinate; and one day it came to Jack's mind that he might call on the giant Fire to help him. And so Jack found out about Steam. Then he could laugh in his turn at the giant Wind, who could not stop him now on land or sea, and who was ever forced to give a helping breath to his great red brother Fire.

And so these three great giants ran at the bidding of little Jack, with their great pulse throbbing, over all the globe.

In a hundred ways, small and great, these giants served Jack, their master, in mill and forge and factory. One giant would help him against the other two, as happens nowadays when the fire company is called out.

Many years passed before Jack found another most mighty but invisible giant, whose name is Electricity; and Jack tamed him also. "I cannot see you," said Jack, "but I know that you can run faster than Wind. You, therefore, must carry my messages. I will sit here and tap with my finger on a little button, and you shall whisper my secrets on the instant at the other end of the world." And so it has come about.

The giant killer of old destroyed the useless monsters of the legends; but the Jack of our own day has done a nobler thing: he has *tamed* the giants and made them surrender their imprisoned secrets, and lend their mighty strength to aid man's littleness.

There are great giants yet, whose secrets are but little known to our Jack of to-day. These must be found, though the way through the enchanted forest should be dark and uncertain.

As Jack climbs higher and higher up the bean stalk of knowledge, fresh wonders grow upon his sight; new giants make him conscious of their power; but he gains will and strength from each new effort to see far, far into the region of infinite possibilities, while we wait and watch for some new strange leaf of the bean stalk that he may throw down to us.

R. André.

XXIV. BEGINNINGS OF ANIMAL LIFE

LET us suppose that we of the human family had been the only living things upon the earth.

No, that will not do; for earth must provide food for us, and every mouthful of our food has come from something that has lived and grown.

Well, then, we will suppose that there had been no *creatures* of any sort, for we could live well upon grains and fruits, roots and savory leaves: — no birds of the air, no fishes of the sea, no pets among the smaller animals, or helpers among the larger ones, — nor anything to harm or destroy as many of the creatures do.

What an odd world it would be! We cannot think how much we should miss!

Some of the higher animals have the same powers that we have. They see, hear, taste, and smell as well perhaps as we. In a wild state they know what is good for them to eat and when they have had enough. Beginning as little babies they build up a body and keep it in repair. Most of them know when enemies are near and how to defend themselves or find places of safety. It would be a wise human child that could do all that.

The eagle's sight, the keen scent of the dog and fox, and the wisdom of the ant and bee are powers we would like to borrow.

This is not to be an animal book; but an earth without animals would not be earth as we know it, so we must not have a book about earth without some notice of its animal population.

Instead of the higher creatures I am going to select *beginners* in the art of living, so that you may see life at work with simple tools of its own making.

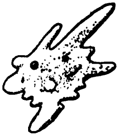
The world is full of living creatures that are too small for us to see without help. The germs that make people ill are examples of the marvelous power life has in even very simple bodies.

When you are older you will understand how each little bit of the body of large creatures can have a life and a work of its own, like the tiny moneron of the next lesson, as well as a part in the work of the whole creature.

XXV. A CREATURE WITH ONE GIFT

When you began to study numbers you had *one* for a first lesson. All the numbers are made of ones. The amœba may be called the *one* among the living creatures. Would you like to study it?

It is so tiny that you will have to put on spectacles; not common ones either, but the kind called *microscopes.* A very good microscope it must be, with one glass above the other in a hollow tube, and with a mirror to throw light where it is needed.



When you look through the microscope you will think at first that there is little to see, for this simplest of creatures has neither feet nor hands, arms nor legs, eyes nor ears, nor anything suitable for a body to put them upon if it had them. Yet it can teach us a lesson and set us an example which, if we followed it, would make our lives noble and beautiful.

Where is this tiny *one*-being (moneron), called the amœba, to be found, and what has it?

It might be found almost anywhere, but remember it takes a microscope to help us to discover it.

As to what it has, what have you that you think is your best possession, the one you would not lose for the world? This creature has it also. It is a little spark of real life, and it can take food and grow.

When this moneron gets its growth it does the wonderful thing I have spoken of. Instead of trying to go on living by itself, it begins to draw itself together in the middle, and lo, in a little while it has given half itself away to make a new amœba! Is not this a lesson and an example of sacrifice and service?

Let us try to put ourselves in the place of the amœbæ. We are little drops of something like jelly with hardly color enough to make us visible.

Presently we begin to feel hungry, — everything which has *life* does, — and having no arms to reach out with, and no wings, or fins, or legs, to help us move, we see what we can do with our very soft elastic bodies.

The plan works, and the little body stretches out a bit of itself and clings with it. It happens that what it clings to is good for it to eat. Then it seems to say: "Here I am!" and bring the rest of its body up to the new place.

How does the amœba eat without a mouth? By making a mouth just in the same way that it made a foot or arm. Indeed, the creature is all mouth, for it stretches itself to cover all of its food, and then is all stomach until its need is satisfied, when it gathers itself together and is a living drop again.

This is about all it can do till it begins to feel like attempting this other work of giving away instead of taking; then it gathers about two centers, and as a result there are two amœbæ in place of one.

Suppose it could understand this singular act, what would it think of this other creature just like itself? What are they to each other? Which is mother and which is child?

There is another animal higher up the stairway of life to which the same thing might happen by *accident.* The next story, from *Little Meadow People*, tells about it.

XXVI. THE EARTHWORM HALF-BROTHERS

Early one wet morning a long earthworm came out of his burrow. He did not really leave it, but he dragged most of his body out, and just let the tip end of it stay in the earth.

Not having any eyes, he could not see the heavy gray clouds that filled the sky, nor the milkweed stalks, so heavy with raindrops that they drooped their pink heads. He could not see these things, but he could feel the soft, damp grass and the cool, clear air; and as for seeing, why, earthworms never do have eyes, and never think of wanting them, any more than you would want six legs, or feelers on your head.

The Earthworm had been out of his burrow only a little while, when there was a flutter and a crash, and Something flew down from the sky and bit his poor body in two. Oh, how it hurt! Both halves of him wriggled and twisted, and there is no telling what might have become of them if another big Something had not come to drive the first Something away.

So there the poor Earthworm lay, in two aching, wriggling pieces, and although it had been easy to bite him in two, nothing in the world could ever bite him into one.

After a while the aching stopped, and he had time to think. It was very hard to decide what he ought to do. You can see just how puzzling it must have been, for if you should suddenly find yourself two people instead of one, you would not know which one was which. At this very minute, who should come along but the Cicada, and one of the Earthworm pieces asked his advice.

The Cicada thought he was the very one to advise in such a case, because he had had such a puzzling time himself, when he had crawled out of an old self and could see it by his side. So he said in a very knowing way: "Pooh! That is a very simple matter. I thought I was two cicadas once, but I was n't. The thinking, moving part is the real one, whatever happens, so that part of the worm which thinks and moves is the real worm."

"I am the thinking part," cried each of the pieces.

The Cicada rubbed his head with his front legs, he was so surprised.

"And I am the moving part," cried each of the pieces, giving a little wriggle to prove it.

"Well, well, well, well!" exclaimed the Cicada, "I believe I don't know how to settle this. I will call the Garter Snake." And he flew off to get him.

A very queer couple they made, the Garter Snake and the Cicada, as they came hurrying back from the snake's home. The Garter Snake was quite excited. "Such a thing has not happened in our meadow for a long time," he said; "and it is a good thing there is somebody to explain it to you, or you would be dreadfully frightened. My family is related to the worms, and I know. Both of you pieces are worms now. The bitten ends will soon be well, and you can keep house side by side, if you don't want to live together."

"Well," said the Earthworms, "if we are no longer the same worm, but two worms, are we related to each other? Are we brothers, or what?"

"Why," answered the Garter Snake, with a funny little smile, "I think you might call yourselves half-brothers." And to this day they are known as "the Earthworm Half-Brothers."

A jolly young Grasshopper, who is a great eater and thinks rather too much about food, said he would n't mind being bitten into two grasshoppers, if it would give him two stomachs, and let him eat twice as much.

The Cicada told the Garter Snake this one day, and the Garter Snake said: "Tell him not to try it. The Earthworms are the only meadow people who can live after being bitten in two in that way. The rest of us have to be one or nothing. And as for two stomachs, he is just as well off with one, for if he had two, he would get twice as hungry."

To remind you that all the animals are suited to their place in life, you will like to read this other story, —

THE CONTENTED EARTHWORMS

After a long and soaking rain the Earthworms came out of their burrows; or rather they came part way out, for each Earthworm put out half his body, and as there were many of them and they lived near to each other, they could easily visit without leaving their own homes.

Two of these long slimy people were talking, when a Potato Bug strolled by. "You poor things," he said, "what a wretched life you must lead. Spending one's days in the dark earth must be very dreary."

"Dreary!" exclaimed one of the Earthworms, "it is delightful. The earth is a snug and soft home. It is warm in cold weather and cool in warm weather.

There are no winds to trouble us and there 's no sun to scorch us."

"But," said the Potato Bug, "it must be very dull. Now out in the grass one finds beautiful flowers and so many families of friends."

"And down here," answered the Worm, "we have the roots. Some are brown and woody, like those of the trees, and some are soft and white and slender. They creep and twine until it is like passing through a forest to go among them.

"And then there are the seeds. Such busy times as there are in the ground in springtime! Each tiny seed awakens and begins to grow. Its roots must strike downward, and its stalk upward toward the light. Sometimes the seeds are buried in the earth with the root end up, and then they have a great time getting twisted around and ready to grow."

"Still, after the plants are all growing, and have their heads in the air, you must miss them."

"We have the roots always," said the Worm. "And then, when the summer is over, the plants have done their work, helping to make the world beautiful and raise their seed babies, and they wither and droop to earth again, and little by little the sun and the frost and the rain help them to melt back into the earth.

The earth is the beginning and the end of plants and the roots are always with us."

"Truly," said the Potato Bug, "you have a pleasant home, but give me the sunshine and fresh air, my six legs, and my striped wings, and you are welcome to it all."

"You are welcome to them all," answered the worms. "We are contented with smooth and shining bodies, with which we can wriggle our way through the soft brown earth. We like our task of keeping the earth right for the plants, and we will work and rest happily here."

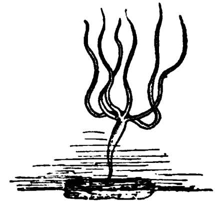
The Potato Bug went his way, and said to his brothers, "What do you think? I have been talking with Earthworms who would not be Potato Bugs if they could." And they all shook their heads in wonder, for they thought that to be Potato Bugs was the grandest and happiest thing in the world.

From *Little Meadow People.*

XXVII. THE HYDRA POLYP

In the hydra we have taken a step upward on the life ladder, for the hydra can be seen without a microscope, and it keeps a form of its own, which I should think quite desirable.

It is of a greenish color, but you would look in vain for eyes and ears, hands and feet, or even a proper head and mouth.



It is said that some learned man once carefully turned one of these little beings inside out, as you could turn a glove. Strange to say, it did not so much as think of dying or even having a good little time of illness, but fell to eating what was given it in the only way it knew how, that is, as the amœba eats.

Either because it could not, or did not wish to, it never took the trouble to get right side out again, which showed that, like the amœba, it was all stomach when it got hungry.

This little hydra polyp is entirely harmless, but it has been the subject of a great many disputes among men. We must use our imaginations a little and try to follow the story, which I think is the best sort of fairy tale because it is all truth.

Let Hydra tell it himself:

" Being greenish in color, I was suspected of taking something from the nature storehouse which only plants have leave to wear. It was the chlorophyll that makes leaves green.

" There was another reason. I was fond of a kind of food which other creatures did not eat at all, or, if they did, only when mixed with something else.

" Now see what troubles these two things got me into. There was a fungus family that lived near me, a humble but respectable family of plants, and I was entirely willing to associate with them. But the question came up whether I was an animal or a plant, and until my case was decided there was no rest for our family.

" *You* might go out into the woods without being mistaken for trees; but a hydra polyp and these fungi were both on such low steps of nature's staircase that no one knew whether both were plants, or one was animal. And *I* was the one in doubt.

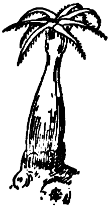
" Think how it would seem if one of the fungi children had said, 'Come over here and take breakfast with us,'—for I could move a bit and they could n't,

—and if when we were eating quietly one of the creatures I thought I belonged among, only that they were n't greenish and did n't eat carbonic acid, should say with a sneer, 'Stay with the green things and eat their strange stuff, you are not one of us at all.'

"The worst of it was that we ourselves did n't know. Millions of hydras lived and died without knowing whether they were plants or animals, just as sponges did.

"Finally wise men made the line between so clear that now plants keep their own side of the stairway and animals theirs; and as much is made of us beginners as human people make of their babies, because we show the beginnings of life.

"There are other polyp families that share with us; they have a way of taking something from the sea with their food which makes hard stems for them. Their work gives them the name *coral builders*, and what they build lasts and is as solid as rock."



XXVIII. THE USEFUL SPONGE

A LITTLE way below the hydra and coral polyps in the art of living is a creature that should interest you. It has given you the sponge for your bath.

The sponge has so few animal signs that it was disputed about as *plant* or *animal* till microscopes came to help settle differences of opinion.

You have never seen a sponge animal, any more than you would see a dog by looking at its skeleton. You have what remains when the sponge has died and all its soft flesh has been taken away.

A baby sponge can be born without dividing its mother into two! When it is ready to care for itself the mother throws it out of her mouth! That is like launching a tiny boat. Little soft hairs paddle it about for a while, and when it becomes tired it settles down till it strikes the bottom of the sea. It has no eyes to see where it is going, but when it finds something to rest against, it clings and stays.

There is plenty of food in the moving water, and it begins to grow, just as you do, with nothing but its inner mind to tell it how. Presently it begins to show thicker substance forming, and its shape grows to be like that of sponges you have seen. It sucks water into the tiny *holes* such as you see in sponges and then draws itself together so as to drive it out through large ones. This is its work; and, just as you squeeze a sponge in water and then let go, the sponge, by contracting and expanding, pumps the sea water into its innermost chambers, with what it may bring for food.

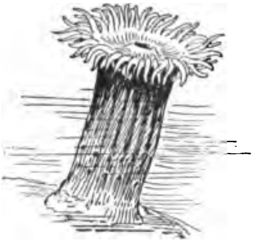
Everywhere, inside and out, the sponge frame is coated over with slimy stuff that is its real flesh. In that there are cells which divide and make new cells, and so keep the sponge growing larger till it gets its growth.

There are sponges all along our coasts; but when the slimy part has been washed off they are not fine and soft, and yet tough and strong, like those we get from the Mediterranean Sea and other far away shores.

To get perfect ones without breaking them, people called *divers* go down to the sea bottom to gather them from the rocks.

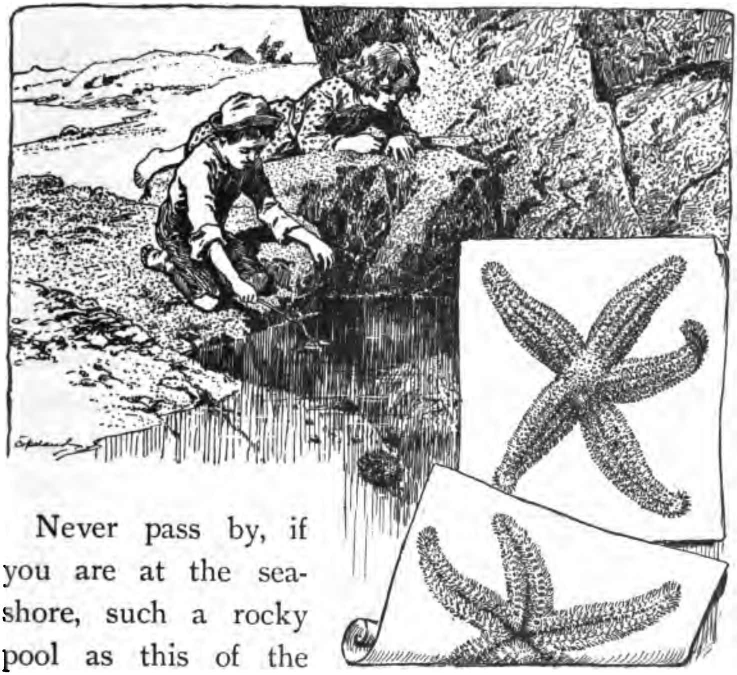
XXIX. THE SEA ANEMONE

EVEN from the picture you must be able to judge that this flower-like creature might be exquisitely beautiful. See if you cannot think into the half-transparent stem, with its many quivering arms, all the purest and most delicate of the colors, — pink, yellow, salmon.



You see that the anemone does not move about, and so is depending upon those fleshy tentacles to seize whatever may pass by that is fit for food and bring it to the center where it can nourish the creature's life. If we were the victims, the beauty of the sea flower would not mean much to us, for it is as greedy a creature as ever lived. But we are studying to see how the wonderful thing we call life uses different sorts of bodies to maintain itself. "Pretty is that pretty does" cannot be a rule for such beings, who know no higher law than to live and grow.

One of the things that put this form of life above that of the polyps is that the center of the flower is a round open sac. We call it a stomach. Another is the way its babies are born. They are thrown out from the center into the sea, where the light forms float about a little while and then cling to some substance for support, as the sponge children do.



Never pass by, if you are at the seashore, such a rocky pool as this of the picture. There is sure to be something interesting to see in it.

The walls will be lined with clinging barnacles and snails of all sizes, and there will be sure to be tough, leathery plants of red, yellow, and brown colors, and possibly a crab or two crawling about with a sidewise motion. If the tide comes to wash it every day and keep its waters pure there may be anemones in it. These children are looking for starfishes and sea urchins, which they have seen on the beach but never before in the water. If you do not chance to come upon sea anemones when they are feeding, very likely you may overlook them, for the tentacles curl back and the stem settles down and they appear only as little mounds of thick grayish jelly.

Sea anemones have a pretty way of attaching themselves to the piles of bridges which the tide washes every day. When their bright clusters of tentacles are all in motion it seems as if the black posts were wreathed with flowers.

XXX. TOOLS TO WORK WITH

The different parts of the creatures we have studied were their tools or *organs* to work with, and the work was breathing, growing, feeding, and moving about.

The lowest forms had simple organs and used them for everything. Any part of a hydra will do for a stomach, but if you cut a sea anemone in two you will kill it. The higher the animal is the more tools it has, and the harder it is for it to get on without each one.

This is the way it is in the world of people. Savages can make the few things they need, but, as we saw in Book Two, it takes a multitude of trades to provide for the wants of civilized people, and the tools that are used are nearly countless.

We have set the amœba, the sponge, the hydra, and the anemone side by side to show a kind of staircase or ladder which the invisible worker Life has builded, with creatures for the steps. The next lesson shows higher steps and so more organs or instruments. Even simple eyes for seeing, feet for walking about, and nerves to warn of danger would be upward steps.

XXXI. THE STARFISH AND SEA URCHIN

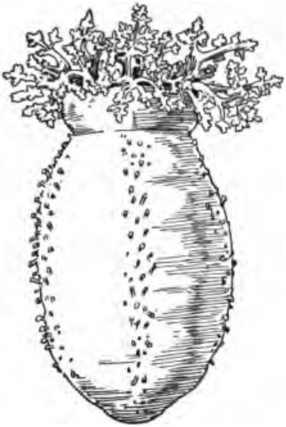
Why should a creature whose life is mostly in the sea have such a regular, pretty shape as that of a star?

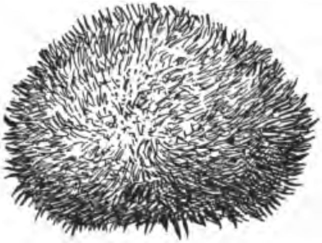
If you ask me the question I shall answer it by another, "Why should it not?" Beauty is not something apart, but a best way for things. Look at the starfish and see if it is not well fitted for its life of crawling about. Think! it can change its wee bit of a mind and go five different ways without turning around.

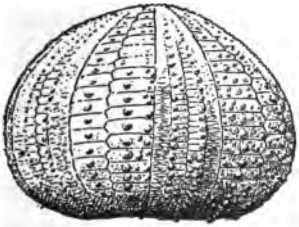
At the end or tip of each arm is a little red eye which we see only when the creature is in danger. There is no need of its turning around to look. When the starfish wishes to fold its arms, or when there is food to grasp, the mouth at the center is the place to curl to, and then the star becomes a ball.

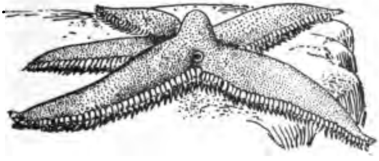
On the underside of the arms are a great many little fleshy feet which push out under its thick tough skin. On the upper side the red, orange, or crimson colors make it pretty.

As these creatures are higher than the others we have studied, we are not surprised that they have









veins carrying blood all through the body, and nerves to help them know what is worth their while to know.

Because the starfish can feel it can know danger. If you frighten it, it will draw up into a ball. If a ray gets broken another will grow. In great peril it may throw them all away and grow new ones.

The sea urchin or sea egg and the rest of the animals in the picture show traces of the star form. The sea urchin has spines all about its rough skin. It can fold them or keep them bristling. It uses them to bury itself in the sand. It can climb steep rocks, but for this it uses the fleshy feet like those of the starfishes.

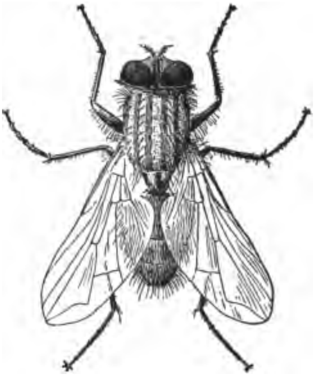
When you are at the seashore ask a fisherman to bring you some baby roughskins. These spiny creatures are the first ones in the ascending scale to have different forms when they are grown up from those they had as babies. When nearly full-grown they throw away the organs used in babyhood to make room for the new ones which have grown underneath to take their place. It will interest you to watch the change from a soft hairy ball to a beautiful starfish, sea urchin or sea cucumber.

Starfishes are always hungry, and oysters are their favorite food.

XXXII. THE HOUSE FLY

WHAT has this little boarder in your home told you of itself in all the years you have been getting acquainted with it?

Nothing! Oh, yes, it has, only you have not put it into words.



We will call it up and help it tell its story, as it plays in the sunbeams, goes on its exploring tours in our rooms, or helps itself to food we thought was ours.

You think it a very troublesome visitor? Try to forget that side and look at its stripes of beautiful fawn color, legs of golden brown, and eyes as bright as your own.

Let it call itself "I" and tell its own story:

"I was raised last winter and have just now molted, that is, changed my dress. This is what makes me so velvety and bright.

"Have you noticed my proboscis? I am sure it is a marvelous thing.

"You can't see inside? Then let me tell you. It is a soft, spongy tube that can be made long or short, held out or drawn back, just as best pleases me.

"I get all my food through it, as you must have seen; and all through it runs a muscle filled with many hairs, which are sensitive nerves. At the end are two flattened lips. In the same way that you have in your mouths a fluid that moistens your food before you swallow it, I moisten mine, and the nerves of touch and taste help me select my food.

"I am particular what I eat; if there are several things to choose from, I try them all and then go a short distance away and make my proboscis quite clean before I go back to sip from the dish I like best.

"My eyes are a marvel, too, if you will excuse my saying so much of myself.

"You must have observed that I have no way of turning my head around; in place of that I have *five* eyes, and I have no more trouble using them than you have with two, though I only see with one at a time.

"Three of my eyes stand in a triangle on the top of my head; the other two are compound eyes, that is, they have a great many tiny single eyes joined in one. As they face in different ways I can look almost every way without turning. There is one thing I cannot do, and that is look straight forward.

"I will not take time to tell you what you can so easily see yourselves by looking at the underside of my body, but every one thinks it curious that the saliva to moisten my food is in two little sacs which the proboscis can reach and draw from as I need.

"The mosquito and I, having but one pair of wings, which are kept open, value very highly our *poisers*, pairs of winglets which help to balance us as we fly.

"Any one can tell you what fine contrivances we have in our feet to hold us fast as we light or crawl on walls or ceiling. The secret of it is a fluid that oozes out against the wall or windowpane. It does not fasten us so as to make it hard to get away, but it holds while we press. How the fluid gets to the feet is still a mystery.

"There are other things about the great family of flies, with its thousands of country cousins, but this is enough to tell at once."

XXXIII. THREE LIFETIMES

In telling its story the fly omitted to say that it belongs to the great and wonderful race of *insects*. It would take a whole book to tell but a little about each of the insect tribes. We can think only of the one thing, which seems to be their secret, that of having three kinds of life.

You remember that the fly talked of a mouth, eyes, and a head; of body, legs, feelers, wings, etc. Some of the insects have wonderful powers and organs. We saw that the roughskin babies were the first in the upward scale to change their forms. The *insect children* are born from *eggs*, and they do not bear the least resemblance to their parents. The fly had probably never been told that in its early life it was only a wriggling maggot, for in its middle or *pupa* state it lost nearly every trace of being alive.

If the insect we are considering is a gorgeous butterfly, its first or *larval* state was that of a caterpillar; if it is a beetle, it was a grub.

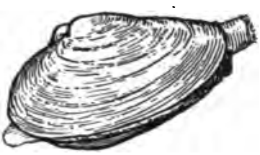
That first life, which might have been a few hours long, but was probably months, seems quite distinct and separate. We wonder if the little creeping or crawling or swimming thing knew what it was going to become.

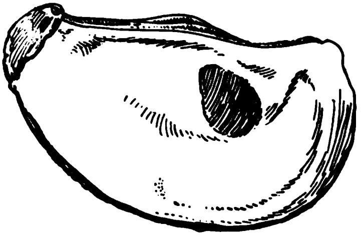
Before it came to its perfect state, which is called *imago*, because it is then the image of its mother, it had a middle life, called *pupa*.

This was longer or shorter, according to its kind, but whatever went on in it was covered or masked, as if it were not to be observed. It was a sort of sleep out of which it would wake by and by. Something like a cocoon of its own making wrapped it around.

In the perfect state length of life does not seem to count for anything. The insect may live but a few hours or days. There will be time for it to lay eggs in the right sort of place to have the grub or maggot or caterpillar find the food it wants.

Just below the insects in the scale of life come spiders, crabs, and lobsters; and above them, though you might not think it, are the shell or armor bearers, as you shall learn in the next lesson.





XXXIV. MANTLES AND SHELLS

THE most of us are acquainted with some of the animals this lesson tells about. Children have a rhyme:

Open your mouth and shut your eyes,
I 'll give you something *to make you wise.*

Perhaps we know the clam and oyster better by *taste* than by their organs to work with.

If you have ever seen a common slug you have had a good specimen of the use of a mantle. Slugs are not pleasant to look upon, but it is worth while to see the thick, elastic skin which covers the soft flesh. By means of this the slug can make itself long or short, round or flattened. It moves chiefly by *stretching* forward.

Creatures like the clam and oyster had the mantle, but being good to eat they needed a better protection. Let us see along what line it came to them.

The good fairy that watched over their growth was not pleased to have them so exposed to enemies as the jellyfish kind are.

The water all about them was full of lime, but since it was not *food* few of the creatures had seemed to find a use for it. If one wishes to be a new creature one must attempt a new thing. The new thing in this case was finding a way to stiffen the outside mantle with lime and make a shield against danger.

So oysters and clams and scallops grow shells as easily as we do finger nails. The rest of the body is soft and tender, but on occasion they hold their two-leaved shells tightly together.

Within the shell and mantle the soft parts of the maker are kept safe, so that the work of digesting food can go on. The stomach receives the food through something quite like a throat, and this leads to a passage for taking away what is not fit for the creature's use and pressing it out of the body. There is also an organ such as in higher animals is called the liver, in which fluids which would be hurtful can be separated.

As this is one of the lowest of the animals which are used for food, it is interesting to know something of its nature.

The shell-bearers seem to be gifted with a number of new powers. If the lowest creatures need air they take it as they do their food into whatever they have for a stomach. Clams and oysters have a good little way of their own for *breathing*. Even after oysters have been cooked you can find frills which are the gills that let them take the air from water.

If air is needed it must be because there is blood to be kept pure. The oyster and clam have it, though it is white and cold. They have nerves also and can tell their organs what to do. People who like to watch their ways better than to get them for food tell us they can hear and smell, and that there are tiny red spots that are supposed to be eyes, but how much good they do no one can tell yet.

Oysters live in beds at the bottom of the sea, but not where the water is deep. In the open shell in the picture you can see *a spot*. Every oyster shell has it. It is the place where a strong muscle is joined, and below it the shell is fastened to the sea bottom. Oysters lay thousands of eggs, and there are many times as many oysters born as those that live and grow three or four years, when they become fit for food. In spite of their shells, they have many enemies — among them, as you have been told, starfishes.

In place of shells outside, the creatures on the ascending stairway began now to grow bony frames to support the soft flesh. They learned to defend themselves by their wits. The frog and toad, the reptiles, all the fishes, all the birds, and all the fourfooted creatures have their places in this scale, and at the top stands the family to which you yourself belong, which is an animal family though it is also the human family.

Human beings can learn about all the things that belong to their lives, can help in the work of making them perfect, and can use them so as to be a blessing to the world.

Earth and sky were made for them and beings like them, and all things are given for their use by the Creator and Father.

You will be sure not to make the mistake of thinking that this is simply to give them a chance for a good time; it is to lead them on to something higher and greater than we can yet understand.

This is the last of the creatures we can find space for in this book. If you have been interested to see how life works in different sorts of bodies, you will watch for other ways, and all creatures will have a greater interest for you.

XXXV. GIVING AND TAKING

When you see the brooks and rivers hurrying to the sea and making such a show of adding to its waters, it may please you to remember that just as much goes back, without show, to feed the springs that keep the rivers flowing and singing and sparkling.

Air will drink from anything that has moisture that it can part with. If you hang a wet handkerchief on a line or spread it upon the grass on a fair day, it will be but a few moments before the moisture will have been stolen from it.

How is it that air, which is so much lighter than water, can drink from it and bear it away? It could not do it if it were water as we see it. The water changes to vapor when the warm sun acts upon it.

Passing from a liquid to this finer form is called *evaporation.*

There are other substances that the air takes and bears away. When you go into a garden where roses and violets and heliotrope and mignonette are in blossom, you get their perfume before you reach the place where they are growing. They give their fragrance to the air, and the air gives it to you.

Foul smells are carried away, and unhealthy substances change to a form the air can manage, and so disappear. This makes the air a *scavenger*.

Our every breath gives something to the air that would be poisonous for us to go on breathing, and plants give out the part of the air they cannot use.

Do you not see that the air must have a laboratory somewhere in which it makes itself right again?

It does have such a laboratory, but we cannot see it. It makes one of its "takings" act upon another, and, if it has room to work in, sweetens everything.

If you have older brothers or sisters studying chemistry, they can tell you that there are always two parts to air besides a very little of other substances. These two are oxygen and nitrogen. The two do not unite, and it is not difficult to take them apart.

There is four times as much nitrogen in the air as there is oxygen, and the mixture always stays the same even if different parts of the two are being separately taken away. This is very important to us who depend upon it for our breath.

Nitrogen dilutes the oxygen in the atmosphere; it is a much lighter gas.

XXXVI. WEATHER

Of all the sky giants, or fairies, the one we wish most to be on good terms with is the weather.

How much of our doing depends upon it! The people of a seaside village where I went once used to say "Yes, if it's *weather*," when asked about doing things. It was amusing to me because there was sure to be weather of some sort, whatever else happened.

A great many things change with weather. Sights and sounds vary; growing things get excused if it has not been kind to them; we all praise or blame it, as if it were a person who ought to treat us well. Here is what one of Dickens' characters heard sitting by the fireside.

It's a dark night, sang the kettle,
  And the rotten leaves are lying by the way;
And above all is mist and darkness,
  And below all is mire and clay.
And there's only one relief
  In all the sad and murky air,
And I don't know that it is one,
  For it's nothing but a glare

Of deep and angry crimson
  Where the sun and wind together
Set a brand upon the clouds
  For being guilty of such weather.

Ours is a very great country; it is both long and wide. While in one section people are delighting in sunshine and wearing summer clothing, those of another may be shivering with cold. Rain may be falling in torrents in one place, and in another crops be suffering from lack of moisture. In the whole United States there might be at the same time all the kinds of weather there are.

Wind, the great weather master, seems all the time to be trying to make things more nearly equal in his great kingdom, the air.

As fast as one part gets overheated he has it rise to the cooler levels of upper air. This sends what was there before on to a new place, and lets cooler currents rush in to fill the place it leaves, for it is a law of his kingdom that there shall be no *vacuum*, or vacant place.

Cool currents come down to the bottom of the air ocean, and flow on till they have spent their force, for a current of air does not have to return as a wave of the sea does.

If a number of different waves are traveling, it must be constantly happening that they meet; and as they have no eyes to see and avoid it, there must be a great many shocks. You may watch battles of the winds almost any day, and it will grow to be interesting as you learn what kinds of lines they take. A spiral is a favorite movement for those that are seeking higher levels, and a circle is always preferred to a straight line.

Wise men, who when they were schoolboys learned their geography lessons well, and when they were older studied geometry, chemistry, and physics, are able to calculate the force and direction of storm winds, and tell where and when they will meet.

The Weather Bureau, whose center is at Washington, is maintained to be of use to farmers, seamen, merchants, and private people in helping them to arrange their affairs wisely. This is possible because of the constancy of nature's laws; thus weather, which we sometimes think is fickle and changeable, is found to be a marvel of quick obedience, and storms are parts of the process of keeping order for a whole world.

XXXVII. THE CLOUD

I BRING fresh showers for the thirsting flowers,
From the seas and the streams;
I bear light shade for the leaves when laid
In their noonday dreams.
From my wings are shaken the dews that waken
The sweet birds every one,
When rocked to rest on their mother's breast,
As she dances about the sun.
I wield the flail of the lashing hail,
And whiten the green plains under;
And then again I dissolve it in rain,
And laugh as I pass in thunder.

I sift the snow on the mountains below,
And their great pines groan aghast;
And all the night 't is my pillow white,
While I sleep in the arms of the blast.
Sublime on the towers of my skyey bowers
Lightning, my pilot, sits;
In a cavern under is fettered the thunder,
It struggles and howls by fits.

. . . .

That orbèd maiden, with white fire laden,
Whom mortals call the moon,
Glides glimmering o'er my fleece-like floor,
By the midnight breezes strewn;
And wherever the beat of her unseen feet,
Which only the angels hear,
May have broken the woof of my tent's thin roof,
The stars peep behind her and peer;
And I laugh to see them whirl and flee,
Like a swarm of golden bees,
When I widen the rent in my wind-built tent,
Till the calm river, lakes, and seas,
Like strips of the sky fallen through me on high,
Are each paved with the moon and these.

. . . .

Sunbeam proof, I hang like a roof,
The mountains its columns be.
The triumphal arch through which I march,
With hurricane, fire, and snow,
When the powers of the air are chained to my chair,
Is the million-colored bow;
The sphere-fire above its soft colors wove,
While the moist earth was laughing below.

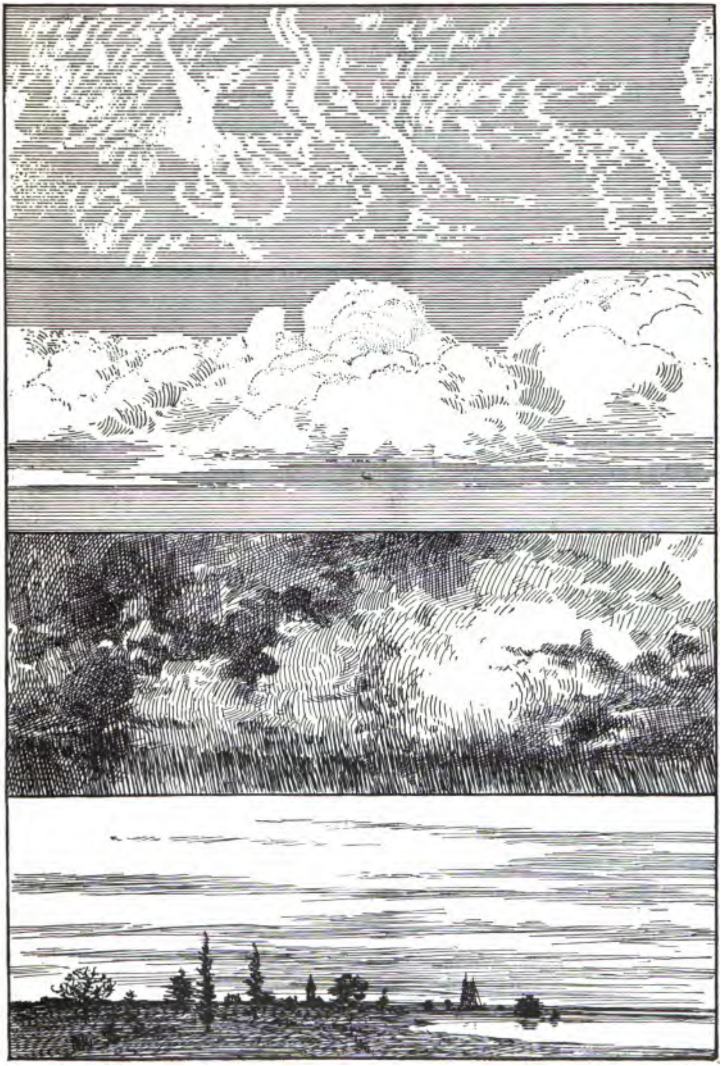
SHELLEY.

XXXVIII. STORM STUDIES

Residents in Earth must take what comes and make the best of it, if they see no way to help themselves. As we have seen, there will sometimes be storms. Let one of these tell its own story:

You are always wrong in telling when storms begin. I began my work two days before you knew about me. If you think you know the worst about storms, you should see the way we work in upper air; but, however it looks, it is only a bit of rough play. The clouds get the worst of it, but they don't mind.

It was a thousand miles away that I began my work. Separate winds had been coming in from every quarter of the heavens, and all at once there was a great hush. We were like a great army waiting for orders. Cool winds, warm winds, dry winds, moist winds, and great reaches of air that had been still too long, began to try to find their places. There was some muttering of thunder, which showed that some clouds were answering by fire bolts; but in the main we were quite still.



All at once a tremendous sweep of air was set up and the circle grew wider and wider, till we were all taken into it. There was no time to ask, "Who began it?"

Clouds from the sea had all the moisture they could hold, and when a cold breath struck them they shook themselves free of it. It was so high in the air that the cloud tears froze as fast as they formed, and we had a pretty brisk hailstorm for a little while. All you could have seen were some thin patchy clouds three miles or more overhead. Sailors call them *cat-tails*, and landsmen *mares' tails*. The real name is *cirrus*, which is the same as curl or ringlet. The upper part of page 97 shows them, and you may often see them in the sky, especially a day or two before a storm.

But I must return to my story.

I took my order to come down to the surface no matter what stood in my way, and a part of the time I must have traveled a hundred miles an hour. You could not have seen me if you had been looking skyward, — which I doubt if you do often, you seem to have so much to occupy you, — till I struck a layer of clouds, of which the lower air had no lack.

They were like those in the second section of the picture. Some people call them *woolsack* clouds; the

Weather Bureau people use the word *cumulus*, which means piled together. In summer these clouds are very beautiful. Sunshine lights their upper surfaces, and in the afternoon near sunset they take on all the sun colors. Clouds look best from above if the sun is shining. Have you never heard people say that every cloud has its silver lining?

Well, as I said, those clouds were directly in my path, and I took all the woolliness out of them very quickly. The third section gives you an idea of the change I made. They spread out and covered the sky for a hundred miles in every direction. I dare say you saw them turn dark and deep blue, with a sort of fringe edge all about them, till finally they nearly covered the sky.

These steel-blue clouds are named *nimbus*, which means rainy.

The rest of the story you know better than I do. What became of me, do you ask?

Oh, nothing in particular. I am one of the children of the giants you read of in Lesson XXIII. We are of consequence only while we are at work, but every day's newspaper tells what some of us are doing to prevent worse disasters than those we sometimes cause.

XXXIX. A BLIZZARD

The blizzard is, fortunately, not an everyday affair.

In order to have one the upper air must be full of ice dust, sharp as powdered glass, and with it tiny frozen snow crystals rushing before a mighty wind.

Next it must happen that the temperature suddenly falls a great many degrees, so that it is unbearably cold.

In the rush the snow and ice particles get pulverized, so that they are fine as flour. They make what is called *white darkness*, in which, while it is light, nothing can be seen.

Travelers caught in such a blast are in danger of death from three different causes: first, from suffocation, the air being too full of the powdered snow to breathe; second, from the dreadful cold; and third, from the shock to the brain of such an ice-laden hurricane.

One such blizzard, the worst that was ever known, began on the 11th of January, 1888, and raged for three days.

In a single day blue sky was replaced by the white darkness of the powdery snow. People had not time to shelter themselves from it; children died by the roadside on their way home from school; farmers perished in the fields before they could reach their homes; a woman, stepping outside her front door to watch for her husband, became so numbed that she had no sense or power to turn back.

The most of those who perished in these long days and nights in which the hurricane roared seem to have been first suffocated and then quickly frozen. They had torn open their clothing to relieve their swollen throats.

This great storm lasted sixty hours, accompanied by such roaring and tumult that the human voice could hardly make itself heard within a few feet.

There is a great deal of mystery in the making of *snow* and *hail* in the chambers of upper air.

Snowflakes are delicate ice needles crystallized in six-pointed stars. Moisture enough to make a rainfall of one inch may have so much air entangled with it as to fall in snow to the depth of ten inches.

Hailstones are even less understood. It seems as if a single drop of water must first have frozen, and that then ice particles gathered around it as it was driven through the air.

Adapted from *The Ocean of Air.*

XL. WIND STORIES

Up the dale and down the bourne,
O'er the meadow swift we fly;
Now we sing and now we mourn,
Now we whistle, now we sigh.

George Darley.

The wind has a language I would I could learn;
Sometimes 't is soothing, and sometimes 't is stern,
Sometimes it comes like a low swift song,
And all things grow calm as the strain floats along.

Hone.

Loud wind, strong wind, sweeping o'er the mountains,
Fresh wind, free wind, blowing from the sea,
Pour forth thy vials like streams from airy fountains,
Draughts of life to me.

Miss Mulock.

Where hast thou wandered, gentle gale, to find
The perfumes thou dost bring?
By brooks that through the winding meadows wind,
Or brink of rushy spring?
Or woodside, where, in little companies,
The early wild flowers rise?

Bryant.

XLI. DUST TRAVELERS

THIS cannot be a pleasant story. Let us take it as we do a medicine and get its lesson.

Children are asked to dust a room sometimes, and they think it a waste of time. "Where do all the dust motes come from?" they ask.

The answer is "From everywhere and everything." Wear and tear, rain and frost, growth and decay, all help to bring them.

Is there a good side to the story?

Yes. Dust floating high in the air helps to hold the mists and clouds. Sunset colors are made brighter, because drops around them divide the light. Fine particles in the air soften the glaring sunlight; even our clear blue sky owes something to them.

If nothing wore away, there would be no need of anything new; would that suit us?

When you have gathered a hundred atoms from mantel or table listen to the stories some of them may tell. Here is a sample:

I came from a shabby shoe; I was brushed from your forehead; I am a bit from the petal of a faded flower; I am soot from the lamp; I came from Florida on an orange. The wind brought me in from the scale on a butterfly's wing, and by my side was a bit of stone from a meteor which fell from far up in the sky; it cannot be expected to know the language you use on earth and tell its story. I came from a refuse pile in your back yard; it should have been taken away long ago.

Some dust particles seen through a microscope told that they had come a thousand miles to the place where they were found.

It will always be true that motes will dance in the sunbeams. It will be well if there are no worse ones than these.

What must we do about it?

Only this, use plenty of soap and water, make friends of brush and broom, and try to keep ourselves so lusty and healthy that a million of these foes will do us no harm.

XLII. THE FACE OF THE SKY

Things of the earth get our attention because they are so close to us. There are things of the *sky*, however, that are quite as worthy of it. How well do you know the face of the sky as you see it every clear evening? Would you know if a new sky were to take its place, or if half the stars should change their places?

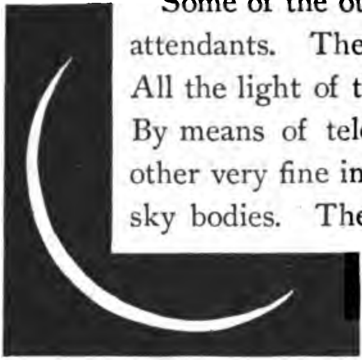
Very long ago people used to fancy the sky as a great hollow globe in which the stars were set like jewels in a crown. Seeing that the stars moved from evening to evening they thought the whole sky moved, carrying the stars with it. We are taught now that each star is a great fiery sun, and that it is only because stars are so distant that they seem so still.

If you will take the trouble, you can trace for yourselves the courses of some of the stars that are always in the part of the heavens that we see. Fix a time in the evening when you will look for special stars or a group of stars; then look at the same hour on every clear evening to see how their positions have changed. Cutting a great paper circle and marking the locations upon it will be a help.

XLIII. EARTH'S NEXT NEIGHBOR

THE moon is the earth's nearest companion. It is neither a planet nor a fixed star.

Its motion is round and round the earth. As the earth revolves about the sun the moon goes along with it as its companion.



Some of the other planets also have moon attendants. The name for them is *satellites*. All the light of the moon is borrowed light. By means of telescopes, spectroscopes, and other very fine instruments people study the sky bodies. They agree that the moon has no appearance of having either air or water.

The most curious thing about the moon is its different shapes; the pictures show some of them. The moon cannot change its form and a globe always looks round; it is plain,

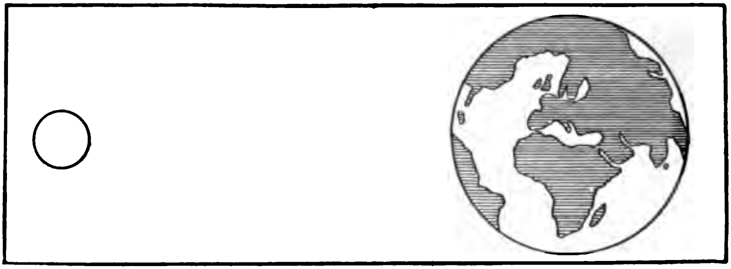
therefore, that except when we have the full moon, something gets more or less in the way of the light from the sun and casts a black shadow upon the part of it that we should otherwise see.

Another curious thing is that in its monthly journey the moon keeps the same side turned to the earth. We see the face but never the back.

The new moon is seen in the western sky. It looks like a crescent with its horns pointed eastward. The reason for its small size is that only a little of the half that is turned toward the sun is also toward the earth. At full moon exactly the same half is facing both the earth and the sun. It rises in the east at about the time that the sun is setting in the west.

Remember that about fifty moons, if well packed into one, would match the size of the earth.

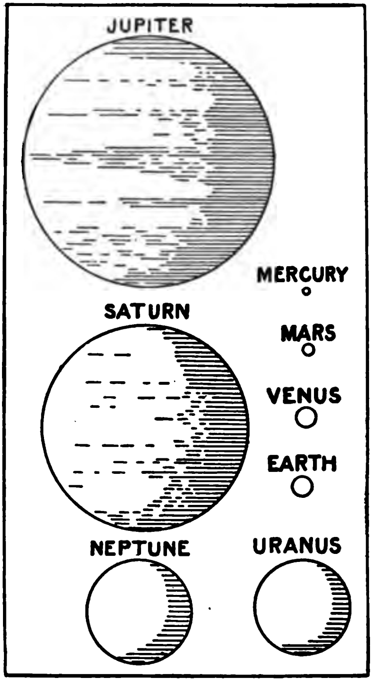
When you see the new moon first it is about two days old. That is, it is two days since it passed between the earth and the sun. Just a week later it is a half-moon, and at sunset has made half its daily journey across our sky. In a week and a day we have the full moon. The other fifteen days of the moon's circuit it is going back to the place between the earth and the sun; for about a week of this time it is out of sight.



XLIV. THE EIGHT SISTERS

THE earth and the moon are not the only sky bodies that shine with borrowed light.

If you were to look closely on a clear night when no moon is shining, you could tell the difference between some of these and the real stars. They are planets, or wanderers, and you have heard the most of their names, —Mercury, Venus, Mars, Jupiter, Saturn, Uranus, and Neptune. Besides these there are smaller planets, or asteroids. The moon, not being a planet but an attendant on the earth, is called a *satellite.* Other planets have their satellites also.



Venus and Mars are like the moon in this, that the face they hold to the earth is not always full. You can observe this of Venus for yourselves. The other planets are much farther away, but wise watchers of the sky have brought them closer by the telescope and found out what before was their secret.

What makes all the planets seem like wanderers is that at different times they are nearer or farther from us. When they are nearest they seem much larger and brighter. The daily newspapers tell us when they are to be seen at their best.

Sky studies have been going on ever since there were people to gaze into the bright sky. It would make a library if all the books about the sky were to be collected. When one astronomer became old, some pupil of his would add to what he had learned.

The sun and the stars that revolve about it make what is called the Solar System. If we wish to describe the earth, we may say that it is a globe or ball in the great sky. It is never still, but moves with a steady motion, in a path like an ellipse, round and round, with the sun for its center. Two other planets are nearer than it to the sun. As you may see, there are four which are a great many times as large.

We cannot tell what might be written in a book called *Mars and the Sky*, or *Saturn and the Sky*.

XLV. COUNTING THE STARS

Robert was offered a dollar by his grandfather if he would count the stars. The night was clear, and there was no moon. Robert thought he might as well begin at once. He had no special interest in the stars, but a dollar had great possibilities in it for him.

The boy lay on his back on the soft, cool grass, so as to see all the sky at once. He guessed there might be a hundred stars, and that there would be a cent for each star that he counted. An hour was allowed him for the work, as it was then eight o'clock. He thought it quite sufficient. Some time was spent in deciding where to begin; but as Venus was the evening star at that time, it seemed a good one to earn his first penny upon. His mother thought so, too.

Mothers can usually be depended upon to encourage the efforts of their children, and he thought he would like to have his mother count also.

Robert was an honest boy, and he was sure that he ought to count as carefully as his father had to count bills at the bank, not missing a single one. There was a long silent time. Robert's mother had not believed he would be so persevering. She did not speak till she heard a sigh and knew that he had stopped counting. "Have you lost count?" she asked.

"Yes," was the answer, "I 'm all mixed up. I 'm afraid I shall have to begin over again."

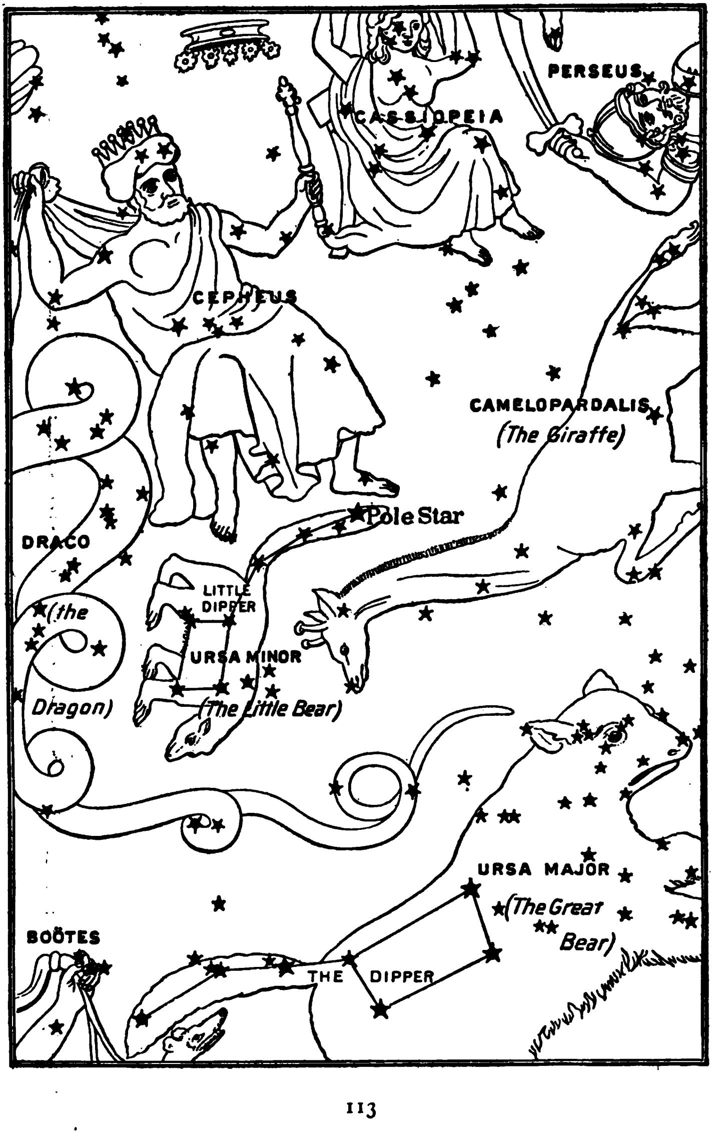
"Oh!" said his mother in a sympathetic tone.

"There are so many of the little ones," Robert added, "and there are no lines to go by. How did *you* get on?" he asked.

"I worked in another way and counted till I reached a hundred, then I think I lost count also. I began, as you did, with Venus and then looked for the other two planets, Jupiter and Mars. We do not always have three planet visitors in sight at the same time.

"Then I went all over the sky for the largest stars —stars of the first magnitude they are called. There were seven of them. That is a good many to have at once. The last time I looked for them there were only six, and in the whole year there would be only fourteen. It was not so easy to count the stars of the second magnitude, of which there are forty in all. I found about twenty and then began back at Venus to count smaller stars."

"It will take another evening," said Robert, "to go all over the sky; I think I had better stop now."


PERSEUS
CASSIOPEIA
CEPHEUS
CAMELOPARDALIS
(The Giraffe)
Pole Star
DRACO
(the
Dragon)
LITTLE
DIPPER
URSA MINOR
(The Little Bear)
URSA MAJOR
(The Great
Bear)
THE DIPPER
BOÖTES

XLVI. THE CONSTELLATIONS

It was a month or two before Robert made his second attempt to number the stars. His mother had pointed out to him, in the meantime, the stars of first magnitude — he had learned to find Vega and the bright star Sirius himself, and had had Regulus and Castor and Pollux pointed out several times.

When Arcturus came first in sight in the eastern sky he was as much interested as his mother; so, when his grandpapa said one night at tea time, "I want you to have that star dollar, Robert!" he asked to be allowed to sit up till it was dark enough for the stars to be bright.

"Will you show me how to count *your* way, mamma?" he asked.

"We will take a better way," was the answer. "I showed you the Great Dipper, the Seven Sisters, Orion's belt, and the Sickle. We will look for more *groups of stars*. Then if you have to stop, you will not need to begin at the beginning again.

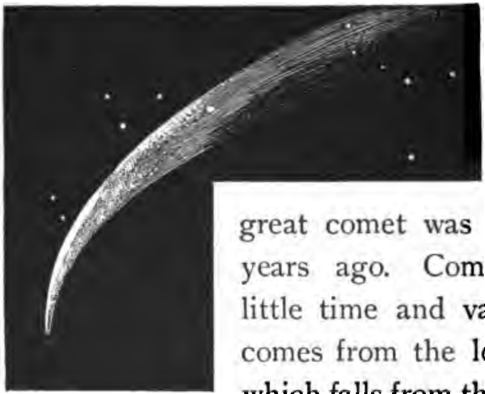
"Groups that make figures in the sky are called *constellations*. There are a good many. The whole sky is overspread with them. When I was a little girl grandpapa taught me to find them, and they seem like old friends that meet me wherever I go. I think you will like to get acquainted with them. David, the shepherd boy of Bethlehem, knew them, and perhaps Moses did in Horeb."

Robert soon became so interested in tracing constellations that he forgot all about counting, till his mother reminded him that they had found *six* stars in the sickle in Leo and *three* in the triangle; the great square in Andromeda had *seven*, and in Orion he found no less than *thirteen;* in the scorpion there were *eighteen*, and it took *seven* to shape the Great Dipper, all but one of them being second magnitude stars. Next was Draco, the dragon, with *twelve*, and close by the Little Dipper with *seven.* Cassiopeia, Boötes, Hercules, and Gemini, which he thought he saw when his mother traced them out for him, easily made up the hundred he thought he was to count at the beginning; and his mother hurried him off to bed before he had time to wonder if his grandfather would think he had earned his dollar.

XLVII. WILD WANDERERS

You are too young to have seen such an appearance in the sky as this of the picture.

A comet is apt to be a fearsome sight. People frighten themselves and each other by asking if it is not a sign of some dread catastrophe that is about to befall the earth.



The latest great comet was seen about thirty years ago. Comets appear for a little time and vanish. The name comes from the long flowing beard which falls from the moonlike center. It has been known to reach halfway down the sky.

Some smaller sky bodies of the same kind you may all see if you look for them before the end of the next August. Meteors are common in that month. They seem like natural fireworks provided for the entertainment of a summer evening. Falling stars are of the same class.

XLVIII. THE MILKY WAY

On a clear night, besides the greater and lesser stars, you may have seen stretching across the sky a broken band of soft whitish light. As you may see in the picture, it is not everywhere of the same width. Here and there in it are stars which would look large and bright if seen standing by themselves.

This much your eyes will tell you of the Milky Way. You can see how it came by its name.

Get an opera glass to look through and see if you cannot find more stars within the bands of light. Perhaps you can borrow a telescope such as captains of ships use at sea. Through it more stars and clusters of stars can be counted, but the white bands do not change. If you could get a chance to look through one of the great telescopes, such as that in California, you would discover more stars; but still the milky background would remain. What makes it, and what does it mean?

It consists of countless stars which distance makes seem near together, and it means that we can get no idea of the greatness of the space which lies about us in every direction, and can have no notion of the number of stars that occupy it.

In arithmetic you will come soon, if you have not done so already, to what is called *enumeration*, or naming orders of numbers. From units, tens, hundreds, thousands, which you can count and understand, you go on to millions, billions, trillions, etc., which could not be counted in a lifetime; in this way you can think what it may mean to speak of the countless stars.

This is the end, for the present, of lessons about things of earth and sky. Should you wish to go further, it must be in another book, which will deal with *people* who have lived on the earth since time began, and learned of its secrets and those of the great space which surrounds it.

SELECTIONS

THE VOICE OF THE GRASS

Here I come creeping everywhere;
By the dusty roadside,
On the sunny hillside,
Close by the noisy brook,
In every shady nook,
I come creeping, creeping everywhere.

Here I come creeping, creeping everywhere;
You cannot see me coming,
Nor hear my low, sweet humming;
For in the starry night,
And the glad morning light,
I come quietly creeping everywhere.

Here I come creeping, creeping everywhere;
My humble song of praise
Most joyfully I'll raise
To Him at whose command
I beautify the land,
Creeping, silently creeping everywhere.

Sarah Roberts.

THE CLOVERS

The clovers have no time to play;
They feed the cows, and make the hay,
And trim the lawns, and help the bees,
Until the sun sinks through the trees.

And then they lay aside their cares
And fold their hands to say their prayers,
And drop their tired little heads
And go to sleep in clover beds.

Then when the day dawns clear and blue,
They wake and wash their hands in dew,
And as the sun climbs up the sky
They hold them up and let them dry;
And then to work the whole long day;
For clovers have no time to play.

HELENA LEEMING JELLIFFE
in *Outlook Story Book.*

TO A DAISY

There is a flower, a little flower
With silver crest and golden eye,
That welcomes every changing hour,
And weathers every sky.

It smiles upon the lap of May,
To sultry August spreads its charm,
Lights pale October on its way,
And twines December's arm.

The purple heath and golden broom
On moory mountains catch the gale;
O'er lawns the lily sheds perfume,
The violet in the vale.

But this bold floweret climbs the hill,
Hides in the forest, haunts the glen,
Plays on the margin of the rill,
Peeps round the fox's den.

On waste and woodland, rock and plain,
Its humble buds unheeded rise;
The rose has but a summer reign;
The daisy never dies!

JAMES MONTGOMERY.

SEED MARVELS

Of all the wonderful things in the wonderful universe of God, nothing seems to me more surprising than the planting of a seed in the blank earth and the result.

Take a poppy seed, for instance; it lies in your palm, the merest atom, a speck, a pin's point in bulk, but within it is imprisoned a spirit of beauty which will break its bonds, come up from the dark ground, and blossom in dazzling splendor.

In this tiny casket lie folded roots, stalks, leaves, buds, seed vessels, all that goes to make up a plant — a plant as gigantic in proportion to the seed as the oak is to the acorn.

You may watch this marvel from beginning to end in a few weeks' time. If you think what a marvel it is, you can but be full of "wonder, love, and praise."

All seeds are most interesting, whether winged like the dandelion and thistle, to fly on every breeze afar; or barbed to catch in the wool of cattle or the garments of men, to be borne away and spread in all directions all over the land; or feathered like the little polished silvery shuttlecocks of the cornflower, to whirl in the wind and settle presently, point downward, into the hospitable ground; or oared like the maple, to row out on the viewless tides of the air.

CELIA THAXTER.

A SUMMER DAY

This is the way the morning dawns:
  Rosy tints on flowers and trees,
  Winds that wake the birds and bees,
Dewdrops on the fields and lawns —
This is the way the morning dawns.

This is the way the sun comes up:
  Gold on brook and glossy leaves,
  Mist that melts above the sheaves,
Vine and rose and buttercup —
This is the way the sun comes up.

This is the way the river flows:
  Here a whirl, and there a dance;
  Slowly now, then, like a lance,
Swiftly to the sea it goes —
This is the way the river flows.

This is the way the rain comes down:
  Tinkle, tinkle, drop by drop,
  Over roof and chimney top;
Boughs that bend, and skies that frown —
This is way the rain comes down.

This is the way the birdie sings:
"Baby birdies in the nest,
You I surely love the best;
Over you I fold my wings"—
This is the way the birdie sings.

This is the way the daylight dies:
Cows are lowing in the lane,
Fireflies wink on hill and plain;
Yellow, red, and purple skies—
This is the way the daylight dies.

GEORGE COOPER.

Come, my soul, thou must be waking!
Now is breaking o'er the earth another day.
Come to Him who made this splendor,
See thou render
All thy feeble strength can pay.

Gladly hail the sun returning;
Ready burning be the incense of thy powers:
For the night is safely ended;
God hath tended
With his care thy helpless hours.

VON CANITZ.

A PARABLE

One day in spring, Solomon, then a youth, sat under the palm trees in the garden of the king, his father, with his eyes fixed on the ground, and absorbed in thought.

Nathan, his preceptor, went up to him and said, "Why sittest thou thus musing under the palm trees?"

The youth raised his head and answered, "Nathan, I am very desirous to behold a miracle."

"A wish," said the prophet with a smile, "that I had myself when I was young."

"And was it granted?" hastily asked the prince.

"A man of God," answered Nathan, "came to me, bringing in his hand a pomegranate seed. 'Observe,' said he, 'what this seed will turn to!' He then made a hole in the earth and put the seed into the hole and covered it. Scarcely had he drawn back his hand when the earth parted and I saw two small leaves shoot forth. But no sooner did I perceive them than the leaves separated, and from between them rose a round stem covered with bark, and the stem became every moment higher and thicker.

"The man of God then said to me, 'Take notice.' And while I was looking, seven shoots issued from the stem, like the seven branches on the candlestick of the altar. I was amazed, but the man of God bade me be silent and attend.

"He then brought water in the hollow of his hand, from the stream which flowed past, and lo! all the branches were covered with green leaves, so that a cooling shade was thrown around us, together with a delicious odor. 'Whence,' said I, 'is this perfume amid the refreshing shade?' 'Seest thou not,' said the man of God, 'the scarlet blossom, as, shooting forth from among the green leaves, it hangs down in clusters?'

"I was about to answer, when a gentle breeze played in the leaves, and strewed the blossoms around us, as the autumnal blast scatters the withered foliage. No sooner had the blossoms fallen than the red pomegranates appeared suspended among the leaves, like almonds on the staves of Aaron. The man of God then left me in profound amazement."

Nathan ceased speaking. "What is the name of the godlike man?" asked Solomon hastily. "Doth he yet live? Where doth he dwell?"

"Son of David," replied Nathan, "I have related to thee a vision."

When Solomon heard these words he was troubled, and said, "How canst thou deceive me thus?"

"I have not deceived thee, son of David," rejoined Nathan. "Behold, in thy father's garden thou may'st see all that I have told thee. Doth not the same thing take place with every pomegranate, and with other trees?"

"Yes," said Solomon, "but by degrees, and in a long time."

Then Nathan answered: "Is it therefore the less a divine work because it takes place slowly and silently? There are no miracles that do not proceed from God. When he reveals himself only in the ordinary course of nature we do not fully realize that he is the sole source of all we witness. It is only when he reveals his power in manifestations not in the ordinary course of nature that we cry, 'A miracle!' If that which is now so familiar because it is so constant were rare or occasional, we should then see in every manifestation of divine power an actual miracle."

I sing th' almighty power of God,
  That made the mountains rise,
That spread the flowing seas abroad,
  And built the lofty skies.

I sing the wisdom that ordained
  The sun to rule the day:
The moon shines full at His command,
  And all the stars obey.

ISAAC WATTS.

THE WAYSIDE INN

I halted at a pleasant inn,
  As I my way was wending —
A golden apple was the sign,
  From knotty bough depending.
Mine host — it was an apple tree —
  He smilingly received me,
And spread his sweetest, choicest fruit
  To strengthen and relieve me.
Full many a little feathered guest
  Came through his branches springing;
They hopped and flew from spray to spray,
  Their notes of gladness singing.
Beneath his shade I laid me down,
  And slumber sweet possessed me;
The soft wind blowing through the leaves
  With whispers low caressed me.
And when I rose and would have paid
  My host so open-hearted,
He only shook his lofty head —
  I blessed him and departed.

JOHANN LUDWIG UHLAND (*translation*).

A MERRY WOODSMAN

Doffing his cap, which was an acorn's cup,
He thus spoke up:
"We be small foresters and gay, who tend
On trees, and all their furniture of green,
Training the young boughs airily to bend,
And show blue snatches of the sky between:—

"We bend each tree in proper attitude,
And founting willows train in silvery falls;
We frame all shady roofs and arches rude
And verdant aisles leading to dryad's halls,
Or deep recesses where the echo calls:—

"We shape all plumy trees against the sky,
And carve tall elms Corinthian capitals,—
When sometimes, as our tiny hatchets ply,
Men say, the tapping woodpecker is nigh.

. . . .

Wherefore, if thou dost prize the shady peace
Of somber forests, or to see light break
Through sylvan cloisters, and in spring release
Thy spirit amongst leaves from careful ache,
Spare us our lives for the green dryad's sake."

THOMAS HOOD.

THE USEFUL PLOW

A country life is sweet!
In moderate cold or heat,
To walk in the air, how pleasant and fair!
In every field of wheat,
The fairest of flowers adorning the bowers,
And every meadow's brow;
So that I say, no courtier may
Compare with them who clothe in gray,
And follow the useful plow.

They rise with the morning lark,
Labor till almost dark,
Then folding their sheep, they hasten to sleep;
While every pleasant park
Next morning is ringing with birds that are singing,
On each green, tender bough;
With what content and merriment
Their days are spent, whose minds are bent
To follow the useful plow.

Anonymous.

MAN'S CONTROL OVER NATURE

Let cities boast that they provide
For life the ornaments of pride;
But 't is the country and the field
That furnish it with staff and shield.
Although no part of nature be
More stored with beauty, power, and mystery;
Yet to encourage human industry,
God has so ordered that no other part
Such space and such dominion leaves for art.

We nowhere art do so triumphant see
As when it grafts or buds the tree.
Who would not joy to see his conquering hand
O'er all the vegetable world command?
And the wild giants of the wood receive
What law he 's pleased to give?
He bids the ill-natured crab produce
The gentle apple's winy juice;
He does the savage hawthorn teach
To bear the medlar and the pear;
He bids the rustic plum to rear
A noble trunk, and be a peach.

COWLEY.

SIGNS OF RAIN

The hollow winds begin to blow;
The clouds look black, the glass is low.
Last night the sun went pale to bed,
The moon in halos hid her head.
Loud quacks the duck, the peacocks cry,
The distant hills are seeming nigh.
Low o'er the grass the swallow wings,
The cricket, too, how sharp he sings.
Through the clear streams the fishes rise,
And nimbly catch the incautious flies.
At dusk the squalid toad was seen
Hopping and crawling o'er the green.
The whirling dust the wind obeys,
And in the rapid eddy plays;
The frog has changed his yellow vest,
And in a russet coat is dressed.

'T will surely rain; I see with sorrow,
Our jaunt must be put off to-morrow.

ANONYMOUS.

THE COMING OF A STORM

Suddenly all the sky is hid
As with the shutting of a lid,
One by one great drops are falling
Doubtful and slow;
Down the pane they are crookedly crawling,
And the wind breathes low.

. . . .

Now on the hills I hear the thunder mutter,
The wind is gathering in the west;
The upturned leaves first whiten and flutter,
Then drop to a fitful rest;
Up from the stream with sluggish flap
Struggles the gull and floats away;
Nearer and nearer rolls the thunder clap,
We shall not see the sun go down to-day;

. . . .

Look! look! that vivid flash!
And instantly follows the rattling thunder
As if some cloud-crag, split asunder,
Fell, splintering with a ruinous crash,
On the Earth, which crouches in silence under;
And now a solid gray wall of rain
Shuts off the landscape, mile by mile.

James Russell Lowell.

THE VOICE OF THE WIND

The wind, when first he rose and went abroad
Through the vast region, felt himself at fault,
Wanting a voice; and suddenly to earth
Descended with a wafture and a swoop,
Where, wandering volatile from kind to kind,
He wooed the several trees to give him one.

First he besought the ash; the voice she lent
Fitfully with a free and lashing change
Flung here and there its sad uncertainties:
The aspen next; a fluttered, frivolous twitter
Was her sole tribute: from the willow came
So long as dainty summer dressed her out,
A whispering sweetness, but her winter note
Was hissing, dry and reedy: lastly the pine
Did he solicit; and from her he drew
A voice so constant, soft, and lowly deep,
That there he rested, welcoming in her
A mild memorial of the ocean cave
Where he was born.

Henry Taylor.

KINDLY WINTER

The snow lies deep upon the ground;
In coat of mail the pools are bound;
The hungry rooks in squadrons fly,
And winds are slumbering in the sky.

Drowsily the snowflakes fall;
The robin on the garden wall
Looks wistful at our window pane,
The customary crumb to gain.

On barn and thatch and leafless tree
The frost has hung embroidery,
Fringe of ice and pendants fine
Of filigree and crystalline.

Pile up the fire! the winter wind,
Although it nip, is not unkind;
And winter days, though dark, can bring
As many pleasures as the spring.

If not the floweret budding fair,
And mild effulgence of the air,
They give the glow of indoor mirth,
And social comfort round the hearth.

The Winter is a friend of mine;
His step is light, his eyeballs shine;
His cheek is ruddy as the morn;
He carols like the lark in corn.

His tread is brisk upon the snows,
His pulses gallop as he goes;
He hath a smile upon his lips,
With songs and welcomes, jests and quips.

'T is he that feeds the April buds;
'T is he that clothes the summer woods;
'T is he makes plump the autumn grain;
And loads with wealth the creaking wain.

Pile up the fire! and ere he go,
Our blessings on his head shall flow —
The hale old Winter, bleak and sear,
The friend and father of the year!

MACKAY.

SPRING CHANGES

The Time hath laid his mantle by
  Of wind and rain and icy chill,
And dons a rich embroidery
  Of sunlight poured on lake and hill.

No beast or bird in earth or sky,
  Whose voice does not with gladness thrill;
For Time hath laid his mantle by
  Of wind and rain and icy chill.

River and fountain, brook and rill,
Bespangled o'er with livery gay
Of silver droplets, wind their way;
All in their new apparel vie,
For Time hath laid his mantle by.

Charles of Orleans.

THE WATER! THE WATER!

The water! the water!
  The joyous brook for me,
That tuneth through the quiet night
  Its ever-living glee.

The water! the water!
  That ever-bubbling spring
I loved and looked on while a child,
  In deepest wondering, —
And ask'd it whence it came and went,
And when its treasures would be spent.

The water! the water!
  The dear and blessed thing,
That all day fed the little flowers
  On its banks blossoming.

The water! the water!
  That roll'd so bright and free,
And bade me mark how beautiful
  Was its soul's purity,
And how it glanced to heaven its wave,
As wandering on it sought its grave.

William Motherwell.

THE OLD MILL

Stream that hastens from the hill,
Tarry here to turn the mill.
Rainbow drops the seedlings knew
In the shower and the dew,
Once again your magic lend,
Life into the mill wheel send.
Nature, the all-bounteous mother,
Beast and bird, and man their brother,
Through the spring and summer weather
Steadily have worked together.
E'en the earthworms in the soil
Gave their share of patient toil.
Sturdy oxen drew the plow
Where the stubble standeth now.
Horse and farmer reaped the grain
From the sunned and watered plain.
Now upon the old mill's floor
Lies the yellow harvest store,
Till the all-transforming wheel
Turns the kernels into meal.
All have helped to give the bread
Over which the grace is said.

LAURA WINNINGTON.

THE FROST

The Frost looked forth one still, clear night,
And whispered, "Now I shall be out of sight!"
So through the valley, and over the height,
In silence I 'll take my way.
I will not go like that blustering train,
The wind and the snow, and the hail and the rain,
That make such a bustle and noise in vain,
But I 'll be as busy as they."

Then he went to the mountain, and powdered its crest;
He climbed up the trees, and their boughs he dressed
With diamonds and pearls; and over the breast
Of the quivering lake he spread
A coat of mail, that it need not fear
The downward point of many a spear
That he hung on its margin, far and near,
Where a rock could rear its head.

He went to the windows of those who slept,
And over each pane like a fairy crept;
Wherever he breathed, wherever he stepped,
By the light of the moon were seen
Most beautiful things. There were flowers and trees;
There were bevies of birds, and swarms of bees;
There were cities, thrones, temples, and towers; and these
All pictured in silver sheen!

But he did one thing that was hardly fair, —
He peeped in the cupboard, and, finding there
That all had forgotten for him to prepare, —
"Now, just to set them a-thinking,
I'll bite this basket of fruit," said he;
"This costly pitcher I'll burst in three,
And the glass of water they've left for me
Shall *tchick!* to tell them I'm drinking."

HANNAH F. GOULD.

DAWN

I had occasion, a few weeks since, to take the early train from Providence to Boston, and for this purpose rose at two o'clock in the morning. It was a mild, serene midsummer's night; the sky was without a cloud; the winds were whist.

The moon, then in the last quarter, had just risen, and the stars shone with a spectral luster but little affected by her presence. Jupiter, two hours high, was the herald of the day; the Pleiades, just above the horizon, shed their sweet influence in the east; Lyra sparkled near the zenith; Andromeda veiled her newly discovered glories from the naked eye in the south; the steady Pointers, far beneath the pole, looked meekly up from the depths of the north to their sovereign.

As we proceeded, the timid approach of twilight became more perceptible; the intense blue of the sky began to soften; the smaller stars, like little children, went first to rest; the sister beams of the Pleiades soon melted together; but the bright constellations of the west and north remained unchanged. Steadily the wondrous transfiguration went on. Hands of angels, hidden from mortal eyes, shifted the scenery of the heavens; the glories of night dissolved into the glories of the dawn.

The blue sky now turned more softly gray; the great watch stars shut up their holy eyes; the east began to kindle. Faint streaks of purple soon blushed along the sky; the whole celestial concave was filled with the inflowing tides of the morning light, which came pouring down from above in one great ocean of radiance, till at length the everlasting gates of the morning were thrown wide open, and the lord of day, arrayed in glories too severe for the gaze of man, began his course.

I do not wonder at the superstition of the ancient Magians, who in the morning of the world went up to the hilltops of central Asia, and, ignorant of the true God, adored the most glorious work of his hand.

EDWARD EVERETT (*adapted*).

BEAUTY OF NATURE

Is it for nothing that the mighty sun
Rises each morning from the Eastern plain
Over the meadows fresh with hoary dew?
Is it for nothing that the shadowy trees

On yonder hilltop, in the summer night
Stand darkly out before the golden moon?
Is it for nothing that the autumn boughs
Hang thick with mellow fruit?

Is it for nothing that some artist hand
Hath wrought together things so beautiful?

. . . .

Beautiful is the last gleam of the sun
Slanted through twining branches: beautiful
The birth of the faint stars — first clear and pale
The steady-lustered Hesper, like a gem
On the flushed bosom of the West; and then
Some princely fountain of unborrowed light,
Arcturus, or the Dog Star, or the seven
That circle without setting round the pole.
Is it for nothing at the midnight hour
That solemn silence sways the hemisphere,
And ye must listen long before ye hear
The cry of beasts, or fall of distant stream,
Or breeze among the tree tops — while the stars
Like guardian spirits watch the slumbering earth?

HENRY ALFORD.

SPRINGTIME FORCES

There is no time like spring,
When life 's alive in everything,
Before new nestlings sing,
Before cleft swallows speed their journey back
Along the pathless track, —
God guides their wing,
He spreads their table that they nothing lack, —
Before the daisy grows a common flower,
Before the sun has power
To scorch the world up in its noontide hour.

There is no time like spring,
Like spring that passes by;
There is no life like spring life born to die, —
Piercing the sod, clothing the uncouth clod,
Hatched in the nest,
Fledged on the windy bough,
Strong on the wing;
There is no time like spring that passes by,
Hastening to die.

CHRISTINA ROSSETTI.

HIDDEN MEANINGS IN NATURE

When Franklin made his discovery of the identity of lightning and electricity, it was sneered at, and people asked, "Of what use is it?" To which his apt reply was, "What is the use of a child? It may become a man!"

When Galvani discovered that a frog's leg twitched when placed in contact with different metals, it could scarcely have been imagined that so apparently insignificant a fact could have led to important results. Yet therein lay the germ of the electric telegraph, which binds the intelligence of continents together and will probably before many years elapse put a girdle around the globe.[1]

So too little bits of stone and fossil, dug out of the earth, intelligently interpreted, have issued in the science of geology, and the practical operations of mining, in which large capitals are invested and vast numbers of persons profitably employed.

The gigantic machinery employed in pumping our mines, working our mills and manufactories, and driving our steamships and locomotives, in like manner depends for its supply of power upon so slight an agency as particles of water expanded by heat.

The steam which we see issuing from the common teakettle, when pent up within an ingeniously contrived mechanism, displays a force equal to that of millions of horses, and contains a power to rebuke the waves and to set even the hurricane at defiance.

---

[1] What was then predicted has already become a fact.

Nay, it is the same power at work within the earth which has been the cause of many of those semi-miraculous catastrophes — volcanoes and earthquakes — that have played so mighty a part in the history of the globe.

SMILES.

LIVING POWER

If we knew the elephant as well as we do the dog or the horse, we should think him the noblest of animals.

In India elephants are too common to be in shows, but sailors like to watch the trained animals at work in the shipyards moving timbers.

Besides drawing great logs by a chain, they will lift them with their trunks, and carry them on their tusks, and will pile them evenly, pushing them into place with the right foot.

You have seen the elephant eat and drink, perhaps, picking up food and sucking up water with his long trunk. One could hardly believe if he did not see that the stout trunk could bend around to put each mouthful of food into the mouth beneath. There is hardly a thing so strong or so delicate that he cannot lift it safely.

SELECTED.

THE GRASSHOPPER AND CRICKET

Green little vaulter in the sunny grass,
Catching your heart up at the feel of June, —
Sole voice that 's heard amidst the lazy noon,
When even the bees lag at the summoning brass;
And you, warm little housekeeper, who class
With those who think the candles come too soon,
Loving the fire, and with your tricksome tune
Nick the glad, silent moments as they pass!

O sweet and tiny cousins, that belong
One to the fields, the other to the hearth,
Both have your sunshine; both, though small, are strong
At your clear hearts; and both seem given to earth
To sing in thoughtful ears this natural song, —
In doors and out, summer and winter, mirth.

LEIGH HUNT.

THE BIRDS AT NIGHT

If you should happen to go out before the birds are awake, or should startle them in the evening after they have gone to bed, where do you think you would find them, and how would their beds look?

For two or three weeks of their lives young nestlings sleep in the nests or holes where they have been hatched, and chicks that have no nests hide their downy bodies under their mother's wings; but this lasts only a short time and after the young birds leave their nests they never again sleep in a bed.

How would you feel if, instead of a comfortable pillow when your mother should say good night, leaving you tucked into a warm bed, you should hear her say, "It is bedtime now, stand on one leg and go to sleep"; or if you should be expected to hang all night from a crack in the wall; or, worst of all, if your bed were to be a pool of water on which you were to float with your head tucked under your arm?

What if the sky is clouded?
What if the rain comes down?
They are all dressed to meet it
In waterproof suits of brown.

Adapted from *Bird World.*

THE CORAL GROVE

Deep in the wave is a coral grove,
Where the purple mullet and goldfish rove;
Where the sea flower spreads its leaves of blue
That are never wet with falling dew,
But in bright and changeful beauty shine
Far down in the green and glossy brine.

. . . .

From coral rocks the sea plants lift
  Their boughs, where the tides and billows flow;
  The water is calm and still below,
For the winds and waves are absent there,
  And the sands are bright as the stars that glow
In the motionless fields of upper air.

. . . .

There with a light and easy motion
  The fan coral sweeps through the clear, deep sea;
And the yellow and scarlet tufts of ocean
  Are bending like corn on the upland lea;
And life, in rare and beautiful forms,
  Is sporting amid those bowers of stone,
And is safe when the wrathful spirit of storms
  Has made the top of the wave his own.

Percival.

HOW THE CORAL REEF WAS BUILT

Every one,
By instinct taught, performed its little task, —
To build its dwelling and its sepulcher.

. . . .

Millions on millions thus, from age to age,
With simplest skill and toil unweariable,
No moment and no movement unimproved,
Laid line on line, on terrace terrace spread,
To swell the heightening, brightening, gradual mound,
By marvelous structure climbing towards the day.

. . . A point at first
It peered above the waves ; a point so small
I just perceived it, fixed where all was floating ;
That speck became a handbreadth ; day and night
It spread, accumulated, and erelong
Presented to my view a dazzling plain,
White as the moon amid the sapphire sea ;
Bare at low water, and as still as death,
But when the tide came gurgling o'er the surface
'T was like a resurrection of the dead ;
From graves innumerable, punctures fine
In the close coral, capillary swarms
Covered the bald-pate reef.

From *The Pelican Island* by JAMES MONTGOMERY.

OPENING FLOWER AND CIRCLING STAR

I

"Not to myself alone,"
The little opening flower transported cries,—
"Not to myself alone I bud and bloom;
With fragrant breath the breezes I perfume,
And gladden all things with my rainbow dyes.
The bee comes sipping, every eventide,
His dainty fill;
The butterfly within my cup doth hide
From threatening ill."

II

"Not to myself alone,"
The circling star with honest pride doth boast,—
"Not to myself alone I rise and set;
I write upon night's coronal of jet
His power and skill who formed our myriad host;
A friendly beacon at heaven's open gate,
I gem the sky,
That man might ne'er forget, in every fate,
His home on high."

MAN AND NATURE

The bubbling brook doth leap when I come by,
Because my feet find measure with its call;
The birds know when their friend is nigh,
For I am known to them, both great and small.
The flower that on the lonely hillside grows,
Expects me there when spring its bloom has given;
And many a tree and bush my wanderings knows,
And e'en the clouds and silent stars of heaven;
For he who with his Maker walks aright
Shall be their lord as Adam was before;
His ears shall catch each sound with new delight,
Each object wear the dress that then it wore;
And he, as when erect in soul he stood,
Hear from his Father's lips that all is good.

Jones Very.

STARS

They glide upon their endless way,
  Forever calm, forever bright;
No blind hurry, no delay,
  Mark the Daughters of the Night;
They follow in the track of Day
  In divine delight.

Shine on, sweet-orbèd Souls for aye,
  Forever calm, forever bright;
We ask not whither lies your way,
  Nor whence ye came, nor what your light.
Be still a dream throughout the day,
  A blessing through the night.

BARRY CORNWALL.

THE OCEAN

There is a pleasure in the pathless woods,
There is a rapture on the lonely shore,
There is society where none intrudes,
By the deep sea, and music in its roar:
I love not man the less, but Nature more,
From these our interviews; in which I steal
From all I may be or have been before,
To mingle with the universe, and feel
What I can ne'er express, yet cannot all conceal.

LORD BYRON.

THE RAINBOW

My heart leaps up when I behold
A rainbow in the sky;
So was it when my life began,
So is it now I am a man,
So be it when I shall grow old,
Or let me die!
The Child is father of the Man;
And I could wish my days to be
Bound each to each by natural piety.

WILLIAM WORDSWORTH.

"ALL THY WORKS PRAISE THEE, O LORD"

HEAVENS

We float before the Presence Infinite,
We cluster round the Throne in our delight,
Revolving and rejoicing in God's sight.

FIRMAMENT

I, blue and beautiful, and framed of air,
At sunrise and at sunset grow most fair;
His glory by my glories I declare.

POWERS

We Powers are powers because He makes us strong,
Wherefore we roll all rolling orbs along,
We move all moving things, and sing our song.

SUN

I blaze to Him in my engarlanding
Of rays, I flame His whole burnt offering
While as a bridegroom I rejoice and sing.

MOON

I follow and am fair, and do His Will;
Through all my changes I am faithful still,
Full-orbed or strait, His mandate to fulfill.

STARS, GALAXIES, AND NEBULAE

No thing is far or near; and therefore we
Float neither far nor near; but where we be
Weave dances round the throne perpetually.

COMETS AND METEORS

Our lights dance here and there, whirl to and fro,
We flash and vanish, we die down and glow;
All doing His Will who bids us do it so.

SHOWERS

We give ourselves; and, be we great or small,
Thus are we made like Him who giveth all,
Like Him whose gracious pleasure bids us fall.

DEWS

We give ourselves in silent, secret ways,
Spending and spent in silence full of grace;
And thus are made like God, and show His praise.

WINDS

We sift the air and winnow all the earth;
And God who poised our weights and weighs our worth
Accepts the worship of our solemn mirth.

FIRE

My power and strength are His who fashioned me,
Ordained me image of His Jealousy,
Forged me His weapon fierce exceedingly.

HEAT

I glow unto His glory, and do good;
I glow, and bring to life both bud and brood;
I glow, and ripen harvest crops for food.

FROST

I make the unstable stable, binding fast
The world of waters prone to ripple past;
Thus praise I God, whose mercies I forecast.

SNOW

My whiteness shadoweth Him who is most fair,
All spotless; yea, my whiteness which I wear
Exalts His Purity beyond compare.

VAPORS

We darken sun and moon, and blot the day,
The good Will of our Maker to obey,
Till to the glory of God we pass away.

NIGHT

Moon and all stars I don for diadem
To make me fair; I cast myself and them
Before His feet, who knows us gem from gem.

DAY

I shout before Him in my plenitude
Of light and warmth, of hope and wealth and food;
Ascribing all good to the Only Good.

LIGHT AND DARKNESS

I am God's dwelling place, —
And also I
Make His pavilion, —
Lo, we bide and fly,
Exulting in the Will of God Most High.

LIGHTNING AND THUNDER

We indivisible flash before His Fame,
We thunder forth the glory of His Name,
In harmony of resonance and flame.

CLOUDS

Sweet is our store, exhaled from sea or river;
We wear a rainbow, praising God the Giver
Because His mercy is for ever and ever.

GREEN THINGS

We all green things, we blossoms bright or dim,
Trees, bushes, brushwood, corn, and grasses slim,
We lift our many-favored lands to Him.

MEDICINAL HERBS

I bring refreshment, —
I bring ease and calm, —
I lavish strength and healing, —
I am balm, —
We work His pitiful Will and chant our psalm.

BIRDS

Winged Angels of this visible world, we fly
To sing God's praises in the lofty sky;
We scale the height to praise our Lord most High.

BEASTS AND CATTLE

We forest beasts, — we beasts of hill or cave, —
We border-loving creatures of the wave —
We praise our King with voices deep and grave.

SMALL ANIMALS

God forms us weak and small, but pours out all
We need, and notes us while we stand or fall;
Wherefore we praise Him, weak and safe and small.

ALL MEN

All creatures sing around us, and we sing;
We bring our own selves as our offering,
Our very selves we render to our King.

LITTLE CHILDREN

He maketh me,—
        And me, —
            And me, —
                To be
His blessed little ones around His knee,
Who praise Him by mere love confidingly.

ALL

Let everything that hath or hath not breath,
Let days and endless time, let life and death,
Praise God, praise God, praise God, His creature saith.

CHRISTINA ROSSETTI.

ANNOUNCEMENTS

TEXT-BOOKS IN
ELEMENTARY SCIENCE

	List price	Mailing price
Atkinson's First Studies of Plant Life	$0.60	$0.70
Ball's Star-Land	1.00	1.10
Beal's Seed Dispersal	.35	.40
Bergen's Glimpses at the Plant World	.40	.45
Blaisdell's Child's Book of Health	.30	.35
Blaisdell's How to Keep Well	.45	.55
Blaisdell's Our Bodies and How We Live	.65	.75
Burkett, Stevens, and Hill's Agriculture for Beginners	.75	.80
Frye's Elements of Geography	.65	.80
Frye's Grammar School Geography	1.25	1.45
Frye's Child and Nature	.80	.88
Frye's Brooks and Brook Basins	.58	.70
Gould's Mother Nature's Children	.60	.70
Hall's Our World Reader, No. 1	.50	.60
Hodge's Nature Study and Life	1.50	1.65
Holden's The Sciences	.50	.60
Newell's Outlines of Lessons in Botany:		
Part I. From Seed to Leaf	.50	.55
Part II. Flower and Fruit	.80	.90
Newell's Reader in Botany:		
Part I. From Seed to Leaf	.60	.70
Part II. Flower and Fruit	.60	.70
Roth's First Book of Forestry	.75	.85
Shaler's Story of Our Continent	.75	.85
Weed's Seed-Travellers	.25	.30
Weed's Stories of Insect Life:		
First Series	.25	.30
Second Series. (Murtfeldt and Weed)	.30	.35

GINN & COMPANY Publishers

NATURE STUDY

	List price	Mailing price
The Jane Andrews Books:		
The Seven Little Sisters	$0.50	$0.55
Each and All	.50	.55
Stories Mother Nature Told Her Children	.50	.55
My Four Friends	.40	.45
Atkinson's First Studies of Plant Life	.60	.70
Beal's Seed Dispersal	.35	.40
Bergen's Glimpses at the Plant World	.40	.45
Burt's Little Nature Studies for Little People. Vol. I. A Primer and a First Reader. Vol. II. A Second Reader and a Third Reader . . . each	.25	.30
Burkett, Stevens, and Hill's Agriculture for Beginners	.75	.80
Comstock's Ways of the Six-Footed	.40	.45
Eddy's Friends and Helpers	.60	.70
Frye's Brooks and Brook Basins	.58	.70
Frye's Child and Nature	.80	.88
Gould's Mother Nature's Children	.60	.70
Hale's Little Flower People	.40	.45
Hardy's Sea Stories		
Hodge's Nature Study and Life	1.50	1.65
Holden's The Sciences	.50	.60
Jefferies' Sir Bevis	.30	.35
Lane's Oriole Stories	.28	.33
Long's Wood Folk Series:		
Ways of Wood Folk	.50	.60
Wilderness Ways	.45	.50
Secrets of the Woods	.50	.60
Wood Folk at School	.50	.60
Morley's Little Wanderers	.30	.35
Morley's Insect Folk	.45	.50
Porter's Stars in Song and Legend	.50	.55
Roth's First Book of Forestry	.75	.85
Stickney's Study and Story Nature Readers:		
Earth and Sky, No. I	.30	.35
Earth and Sky, No. II	.30	.35
Pets and Companions	.30	.40
Bird World	.60	.70
Strong's All the Year Round. Part I, Autumn. Part II, Winter. Part III, Spring . . . each	.30	.35
Weed's Seed-Travellers	.25	.30
Weed's Stories of Insect Life:		
First Series	.25	.30
Second Series. (Murtfeldt and Weed)	.30	.35

GINN & COMPANY PUBLISHERS

THE
YOUTH'S COMPANION SERIES
OF SUPPLEMENTARY READERS

THIS important series of supplementary reading books has been made possible by special arrangement with The Perry Mason Company for the right to republish in book form the material that has appeared and is now appearing in *The Youth's Companion.*

For more than seventy-five years this well-known publication has contributed largely to the elevation of the literary taste of the home. In its pages has been accumulated a wealth of material of unique interest and permanent value. The arrangements now completed will result in putting this material within the reach of school children in a graded and systematized form. Each volume is fully illustrated by the originals used in *The Youth's Companion,* the binding is durable and attractive, the size and form convenient, and the price low.

When complete, the series will consist of several groups, each containing several books devoted to a general topic. Five Geographical Readers, two World's Progress Readers, and one Historical Reader are now ready.

GEOGRAPHICAL READERS	*List price*	*Mailing price*
The Wide World	$0.25	$0.30
Northern Europe	.25	.30
Under Sunny Skies	.25	.30
Toward the Rising Sun	.25	.30
Strange Lands Near Home	.25	.30
THE WORLD'S PROGRESS READERS		
Triumphs of Science	.30	.35
Industries of To-Day	.25	.30
HISTORICAL READERS		
Ship of State	.40	.50

GINN & COMPANY PUBLISHERS

STUDY AND STORY NATURE READERS

By J. H. STICKNEY

Author of the Stickney Readers

EARTH AND SKY, No. I. A First Grade Nature Reader and Text-Book. 12mo. Cloth. 115 pages. Illustrated. List price, 30 cents; mailing price, 35 cents.

EARTH AND SKY, No. II. 12mo. Cloth. 118 pages. Illustrated. List price, 30 cents; mailing price, 35 cents.

EARTH AND SKY, No. III.

PETS AND COMPANIONS. A Second Reader. 12mo. Cloth. 142 pages. Illustrated. List price, 30 cents; mailing price, 40 cents.

BIRD WORLD. A Bird Book for Children. *With color pictures.* By J. H. STICKNEY, assisted by RALPH HOFFMANN. 12mo. Cloth. 214 pages. Illustrated. List price, 60 cents; mailing price, 70 cents.

EARTH AND SKY, No. I, the first book of the series in grade, is a little reader which embraces a wide range of topics.

EARTH AND SKY, No. II, is a natural sequel to the earlier book but not dependent upon it for its interest.

EARTH AND SKY, No. III, is planned for the third and fourth grades. In this book more attention is given to the aspects of the sky than was practicable in the earlier books.

PETS AND COMPANIONS, the second book of the series in grade, is a reader of stories and easy studies. Its subjects are such familiar animals as are best calculated to inspire sympathy and affection.

BIRD WORLD tells of the habits, the homes, the songs, and the plumage of the familiar birds of North America; explains how the different families may be distinguished; and leads children to give their protection and friendship to the birds. The well-known artists, Ernest Thompson Seton and L. A. Fuertes, are represented by numerous drawings of typical scenes from the bird world. Several of the illustrations are in color.

GINN & COMPANY PUBLISHERS

To avoid fine, this book should be returned on
or before the date last stamped below

10M—9-39

TX
428,42
S85
bk

CURRICULUM LIBRARY

Stickney, J. H. 79411
Study and story nature readers
Earth and sky Number 3

DATE	NAME	DATE

LIBRARY, SCHOOL OF EDUCATION, STANFORD

79411